2016
LOUISIANA WATER QUALITY INVENTORY: INTEGRATED REPORT

FULFILLING REQUIREMENTS OF THE FEDERAL CLEAN WATER ACT, SECTIONS 305(b) AND 303(d)

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Acronyms and Abbreviations

ADB	Assessment Database
AGR	Agriculture
AL	Action Level
AOI	Area of Interest
ASSET	Aquifer Sampling and Assessment Program
AWQMN	Ambient Water Quality Monitoring Network
BCOID	Business and Community Outreach and Incentives Division
BEP	Beneficial Environmental Projects
BFI	Browning-Ferris Industries
BMP	Best Management Practices
BP	British Petroleum
CALM	Consolidated Assessment and Listing Methodology
CAP	Corrective Action Plan
CEI	Compliance Evaluation Inspections
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFDA	Catalog of Federal Domestic Assistance
CFR	Code of Federal Regulations
CM	Continuous Monitoring
CSGWPP	Comprehensive State Ground Water Protection Program
CSI	Compliance Sampling Inspections
CWA	Clean Water Act
DL	Detection Limit
DNAPLs	Dense Non-Aqueous Phase Liquids
DO	Dissolved Oxygen
DWS	Drinking Water Supply
EDMS	Electronic Document Management System
EQIP	Environmental Quality Incentive Program
ERMA	Environmental Response Management Application
EWOCDS	Early Warning Organic Compound Detection System
FDA	Food and Drug Administration
FWP	Fish and Wildlife Propagation
GOMA	Gulf of Mexico Alliance
GRN	Gulf Restoration Network
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene
HUC	Hydrological Unit Code
ID	Inspection Division
IR	Integrated Report
IRC	Integrated Report Category
LAC	Louisiana Administrative Code
LAIS	Louisiana Aquatic Invasive Species
LAL	Limited Aquatic Life and Wildlife
LCH	Liquid Chlorinated Hydrocarbons
LDAF	Louisiana Department of Agriculture and Forestry
LDCRT	Louisiana Department of Culture, Recreation and Tourism

Acronyms and Abbreviations

LDEQ	Louisiana Department of Environmental Quality
LDHH	Louisiana Department of Health and Hospitals
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LEAN	Louisiana Environmental Action Network
LED	Louisiana Economic Development
LEQA	Louisiana Environmental Quality Act
LOSP	Louisiana Office of State Parks
LOT	Louisiana Office of Tourism
LPBF	Lake Pontchartrain Basin Foundation
LPDES	Louisiana Pollution Discharge Elimination System
LSP	Louisiana State Police
LSU	Louisiana State University
LSUS	Louisiana State University Shreveport
LTSA	Louisiana Tourism Satellite Account
LUMCON	Louisiana Universities Marine Consortium
MBWQS	Municipal, Biosolids, and Water Quality Section
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MSU	McNeese State University
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990
NARS	National Aquatic Resource Surveys
NCP	National Contingency Plan
ND	Non-Detect
NGO	Nongovernmental Organization
NISA	National Invasive Species Act of 1996
NISC	National Invasive Species Council
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment
NTU	Nephelometric Turbidity Unit
OEC	Office of Environmental Compliance
OES	Office of Environmental Services
ONR	Outstanding Natural Resource Waters
OPA	Oil Pollution Act of 1990
OYS	Oyster Propagation
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCR	Primary Contact Recreation
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act

Acronyms and Abbreviations

RECAP	Risk Evaluation/Corrective Action Program
RES	Rollins Environmental Services
ROD	Record of Decision
RPP	Remedial Project Plan
SARA	Superfund Amendments and Reauthorization Act
SCAT	Shoreline Cleanup Assessment Team
SCR	Secondary Contact Recreation
SEAFWA	Southeastern Association of Fish and Wildlife Agencies
SMCL	Secondary Maximum Contaminant Level
SONRIS	Strategic Online Natural Resources Information System
SOP	Standard Operating Procedure
SPOC	Single Point of Contact
sVGP	Small Vessel General Permit
SVOC	Semi-Volatile Organic Compound
SWCC	Soil and Water Conservation Commission
SWPP	Source Water Protection Program
TDS	Total Dissolved Solids
TGP	Tennessee Gas Pipeline
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TRI	Toxics Release Inventory
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
UNO	University of New Orleans
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
VGP	Vessel General Permit
VOC	Volatile Organic Compound
WHIP	Wildlife Habitat Incentive Program
WIC	Water Body Impairment Combination
WIP	Watershed Implementation Plan
WLA	Wasteload Allocation
WQU	Water Quality Unit
WRP	Wetland Reserve Program

PART I: EXECUTIVE SUMMARY/OVERVIEW

Summary of Louisiana's Water Quality Assessment Program

Louisiana, well known for its abundance of water resources, contains over 66,294 miles of rivers and streams, 1,078,031 acres (1,684 square miles) of lakes and reservoirs, 5,550,951 acres (8,673 square miles) of fresh and tidal wetlands, and 4,899,840 acres (7,656 square miles) of estuaries. These figures, some of which are taken from the U.S. Environmental Protection Agency's (USEPA) River Reach 3 file, are known to be low in comparison to the actual total area of Louisiana's rivers, lakes, wetlands, and estuaries. It is the responsibility of the Louisiana Department of Environmental Quality (LDEQ) to protect the chemical, physical, biological, and aesthetic integrity of the water resources and aquatic environment of Louisiana. This responsibility is undertaken through the use of public education, scientific endeavors, water quality management, wastewater permitting and inspections, and regulatory enforcement in order to provide the citizens of Louisiana with clean and healthy water now and in the future.

The 2016 Integrated Report (IR) documents LDEQ's progress toward meeting this responsibility. Louisiana's IR is produced, in part, to meet requirements of the Federal Water Pollution Control Act commonly known as the Clean Water Act (CWA) (U.S. Code 1972, 1987). The primary CWA sections addressed by the 2016 IR are §303(d) and §305(b). Section 303(d) states that each State shall identify water quality-limited segments still requiring Total Maximum Daily Loads (TMDL) within its boundaries for which: (1) Technology-based effluent limitations required by sections 301(b), 306, 307 or other sections of the Act; (2) More stringent effluent limitations (including prohibitions) required by either State or local authority preserved by section 510 of the Act or Federal authority (law, regulation, or treaty); and (3) Other pollution control requirements (e.g., best management practices) required by local, State, or Federal authority are not stringent enough to implement any water quality standards applicable to such waters.

Section 305(b) of the CWA requires each state to provide, every two years, the following information to the Administrator of the USEPA:

- A description of the water quality of all navigable waters in the state
- An analysis of the status of waters of the state with regard to their support of recreational activities and fish and wildlife propagation
- An assessment of the state's water pollution control activities toward achieving the CWA goal of having water bodies that support recreational activities and fish and wildlife propagation
- An estimate of the costs and benefits of implementing the CWA
- A description of the nature and extent of nonpoint sources of pollution and recommendations for programs to address Nonpoint Source (NPS) pollution

For the 2016 IR, LDEQ used USEPA's *Consolidated Assessment and Listing Methodology* (CALM) (USEPA 2002), which contains the IR guidance, as well as USEPA's guidance document, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (USEPA 2005). In addition to the previous two documents, USEPA issues updates to the IR guidance in the form of memoranda prior to each Integrated Reporting period (USEPA 2006). Louisiana's water quality regulations (Louisiana Administrative Code (LAC), Title 33:IX.1101 et seq. (LAC 2015)) were used to determine water quality uses, criteria, and assessment procedures. One of the primary focuses of

USEPA's IR guidance is on the use of categories to which water bodies or water body/impairment combinations may be assigned. A water body/impairment combination is a single parameter (e.g., low dissolved oxygen (DO)) or other impairment assigned to a water body subsegment for assessment purposes. Subsegments are watersheds or portions of watersheds delineated as management units for water quality monitoring, assessment, permitting, inspection, and enforcement purposes. Categorization under IR guidance allows for a more focused approach to water quality management by clearly determining which actions are required to protect or improve individual waters of the state. The eight IR categories used by LDEQ can be found in Table 1.1.1.

Table 1.1.1

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2016 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

IR Category (IRC)	IR Category Description
IRC 1	*Specific Water body Impairment Combination* (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards. Also used for water bodies that are fully supporting all designated uses.
IRC 2	Water body is meeting some uses and standards but there is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 3	There is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists and a TMDL has been completed for the *specific WIC* cited.
IRC 4b	WIC exists and control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited.
IRC 4c	WIC exists and a pollutant (anthropogenic source) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories of IRC 5RC and IRC 5-Alt represent Louisiana's §303(d) list.**
IRC 5RC (Revise Criteria)	WIC exists for one or more uses and a TMDL is required for *the specific WIC* cited; LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments. **IRC 5RC WICs are on Louisiana's §303(d) list.**

Table 1.1.1

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2016 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

IR Category (IRC)	IR Category Description
IRC 5-Alt (Alternative)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, based on the §303(d) long-term vision protocol an alternative approach is expected to achieve water quality goals. **IRC 5-Alt WICs are on Louisiana's §303(d) list.**

On April 20, 2010, British Petroleum's (BP's) Deepwater Horizon drilling rig operating in the Gulf of Mexico approximately 50 miles off the Mississippi River Delta exploded and sank. The resulting oil spill affected a large portion of Louisiana's coastline.

During development of the 2016 IR, LDEQ reviewed Louisiana Department of Wildlife and Fisheries (LDWF) and Louisiana Department of Health and Hospitals (LDHH) fishing and oyster closure areas to determine if oil spill-related closures remain in effect. This review identified that all LDWF and LDHH commercial fishing closures for finfish, shellfish, and oysters have been rescinded. As a result, all spill-related Fish and Wildlife Propagation (FWP) and Oyster Propagation (OYS) use impairments originally reported in the 2012 and 2014 IRs have been changed to full support due to lifting of the LDWF and LDHH fishing closures. Refer to the LDWF Oil Spill Response website for full details on the revised fishing closures (http://www.wlf.la.gov/oilspill).

For the 2016 IR the latest LDEQ monitoring results for the impacted area, which were available through October 2015, were evaluated. Based on this review, six limited portions of subsegments have been assessed as being potentially and/or temporarily impaired for primary contact recreation (PCR). As with the 2014 IR assessments, the 2016 IR assessments represent only specific and limited portions of full subsegments. The portions of subsegments identified as impaired are areas found to still have oil, tar mats, or tar balls present. The full subsegments are assessed based on routine ambient monitoring data or in some cases other information. These six portions of subsegments were placed in IRC 4b. The suspected causes of impairment will be reevaluated for the 2018 IR based on possible future LDEQ monitoring or other surveys of the area.

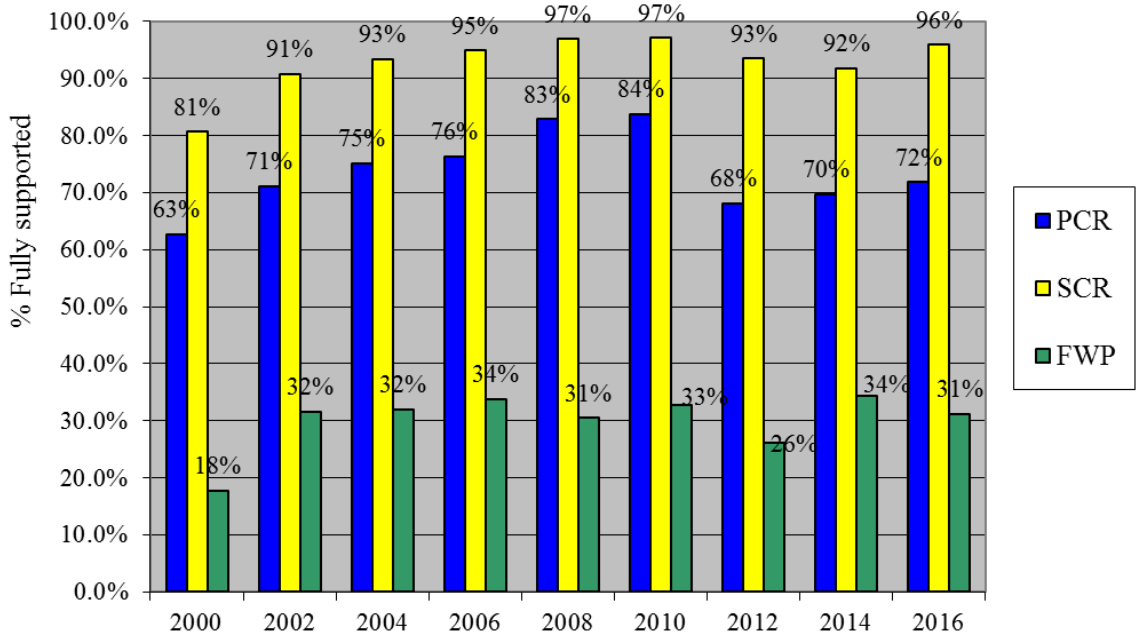
LDEQ and other agencies continue to analyze the impact of the spill on Louisiana's coastal waters. Results of this analysis will be presented in future reports by LDEQ as well as by other national and state agencies and academic researchers. Additional information regarding assessments related to the Deepwater Horizon oil spill can be found in Part III, Chapter 2.

Summary of Overall Water Quality in Louisiana

For the 2016 IR both the designated uses of PCR (or "swimming") and secondary contact recreation (SCR or "boating") showed slight improvement in designated use support (Figure 1.1.1). Support of the PCR use increased from 70% of assessed water body subsegments showing full support to 72% fully supporting the use, while SCR use support improved from 92% to 96% of subsegments supporting the use. Of the subsegments still showing impairment of the PCR and SCR uses, nearly 90% are due solely to elevated fecal coliform densities.

Fish and wildlife propagation use support decreased slightly from 34% to 31% of assessed water body subsegments. This is slightly better than the average use support of 30% between 2000 and 2016. Low FWP use support is due in part to the large number of water quality parameters and information used to assess the use. LDEQ currently analyzes DO, chlorides, sulfates, total dissolved solids (TDS), turbidity, non-native aquatic plants, pH, oil/tar/grease, seven different metals, and dozens of organic compounds including pesticides when assessing water quality for this designated use. In addition to these monitored parameters, the presence of fish consumption advisories due to mercury or organic chemicals also results in impairment to this designated use.

Figure 1.1.1
Comparison of the percentage of water body subsegments in Louisiana fully supporting the three primary designated uses; 2016 Louisiana Integrated Report.



Summary of Suspected Causes of Impairment to Water Quality

Table 1.1.2 lists all suspected causes of impairment for all designated uses. Low DO, used to determine support of the FWP use, continues to be the most frequently cited suspected cause of impairment with 188 subsegments affected, up from 177 subsegments in 2014. Fecal coliform ranks second in terms of the number of subsegments impacted (129). This suspected cause of

impairment is used to assess the designated uses of PCR and SCR, as well as drinking water supply (DWS) and OYS. Mercury in fish tissue continues to be third in frequency of impairments with 103 subsegments affected (Table 1.1.2). Total dissolved solids moved to the fourth most frequently cited source of impairment (85 subsegments), while turbidity fell to fifth with 83 subsegments affected. Highly turbid waters can cause problems for aquatic life and aesthetic concern for human recreation.

Nutrient listings, including nitrate/nitrite and total phosphorus, were first reported many years ago based on qualitative evaluative assessments rather than on data analysis. Remaining nutrient listings are closely associated with low DO impairments. The suspected impairment causes of TDS, sulfates, and chlorides are all related to the concentration of certain minerals and other natural or introduced substances in the water.

Due to the large number of subsegments previously reported as impaired for pesticides based on "evaluative" information (i.e. subjective evaluations with no analytical data to support the reported impairment), the LDEQ Nonpoint Source Program conducted an extensive pesticides monitoring project. Based on this project, 40 of the previously reported impairments for pesticides have been removed for the 2016 IR. These include Carbofuran, DDT, Fipronil, Toxaphene, and Methoxychlor. Of the many pesticides previously reported as impairments in the IR only two, atrazine and methyl parathion, remain as impairments on one subsegment.

Finally, chemicals commonly associated with industrial activities are reported infrequently (Table 1.1.2). These include lead; polychlorinated biphenyls (PCBs); hexachlorobenzene (HCB); hexachlorobutadiene (HCBD); polycyclic aromatic hydrocarbons (PAHs); 1,1,1,2-tetrachloroethane; 1,2-dichloroethane; bromoform; 2,3,7,8-TCDD; 2,3,7,8-TCDF; and phenols. LDEQ currently tests for 35 volatile organic compounds (VOCs) on a quarterly basis at all ambient monitoring sites. In addition, three Mississippi River sites are tested monthly for 31 VOCs, 29 PCBs and pesticides, and 54 semi-volatiles and phenols. Between October 3, 2011 and September 15, 2015, 63,319 organic chemical analyses were recorded by LDEQ. Of these, only 259 results, less than one-half of one percent of all samples analyzed, recorded detectable concentrations of the chemical analyzed. The 259 detections resulted in ten aquatic life, human health drinking water supply, or human health non-drinking water supply criteria exceedances. This represents only 0.16% of all available sample results. Among the ten criteria exceedances, only one subsegment, Grand Bayou (LA100709_00), was reported as impaired for drinking water use. It had two criterion exceedances in the four year period of record for the 2016 IR. The two criterion failures for LA100709_00 were approximately three months apart. The compound, 1,2-dichloroethane, is an older but commonly used solvent in cleaning products, so it is possible the criterion exceedances were due to accidental releases. LDEQ regional staff and Louisiana LDHH drinking water staff were notified of the impairment. All remaining organic chemical detections were either below Louisiana water quality criteria, or occurred only once during the last four years. More information on procedures for assessing organic compounds can be found in Part III, Chapter 2.

Table 1.1.2

Number of water body subsegments impacted by each suspected cause of impairment; includes all designated uses. *2016 Louisiana Integrated Report* assessment.

Suspected Causes of Impairment	River	Lake	Estuary	Wetland	Total
Oxygen, Dissolved	155	23	7	3	188
Fecal Coliform	109	11	8	1	129
Mercury in Fish Tissue	73	20	9	1	103
Total Dissolved Solids	69	15		1	85
Turbidity	66	17			83
Nitrate/Nitrite (Nitrite + Nitrate as N)	38	6			44
Non-Native Aquatic Plants	27	16	1		44
Phosphorus (Total)	36	6			42
Sulfates	37	1		1	39
Chloride	24	1		1	26
Color	7	2			9
Lead	8	1			9
Temperature, water	7	2			9
Polychlorinated biphenyls	3	3			6
pH, Low	5				5
pH, High		3			3
1,2-Dichloroethane	2				2
2,3,7,8-Tetrachlorodibenzofuran	2				2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (only)	2				2
Benzo(a)pyrene (PAHs)	2				2
Copper	2				2
Hexachlorobenzene	1	1			2
Hexachlorobutadiene	1	1			2
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	2				2
1,1,1,2-Tetrachloroethane	1				1
Arsenic		1			1
Atrazine	1				1
Bromoform	1				1
Mercury		1			1
Methyl Parathion	1				1
Phenols	1				1
Oil and Grease	1				1

Summary of Suspected Sources of Impairment to Water Quality

Table 1.1.3 provides a list of all suspected sources of subsegment impairment across all designated uses. The large number of subsegment listings for *source unknown* and *atmospheric deposition-toxics* is largely due to the high number of mercury-related fish consumption advisories in Louisiana. *Natural sources* were reported for 160 subsegments. This single suspected source was primarily related to low DO, chlorides, sulfates, TDS, and turbidity; however, six other suspected causes also included natural sources as the suspected source. In addition to the 160 subsegments specifically reported for natural sources, 88 subsegments were reported for other suspected sources of impairment related to natural conditions.

Table 1.1.3

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2016 Louisiana Integrated Report* assessment.

Suspected Sources of Impairment	River	Lake	Estuary	Wetland	Total
Natural Sources	132	20	6	2	160
Source Unknown	110	28	10	1	149
Atmospheric Deposition - Toxics	73	19	9	1	102
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	80	2	3		85
Agriculture	67	14		1	82
Package Plant or Other Permitted Small Flows Discharges	42	2	3		47
Introduction of Non-native Organisms (Accidental or Intentional)	27	16	1		44
Sewage Discharges in Unsewered Areas	20	11	1		32
Municipal Point Source Discharges	26	1			27
Wildlife Other than Waterfowl	20		3	1	24
Waterfowl	11	4	4	1	20
Drought-related Impacts	17	2			19
Industrial Point Source Discharge	15	3			18
Livestock (Grazing or Feeding Operations)	16	1			17
Sanitary Sewer Overflows (Collection System Failures)	13	2	2		17
Silviculture Activities	14	3			17
Sediment Resuspension (Clean Sediment)	8	3			11
Rural (Residential Areas)	10				10
Site Clearance (Land Development or Redevelopment)	7	3			10
Discharges from Municipal Separate Storm Sewer Systems (MS4)	6	2	1		9
Runoff from Forest/Grassland/Parkland	8	1			9

Table 1.1.3

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2016 Louisiana Integrated Report* assessment.

Suspected Sources of Impairment	River	Lake	Estuary	Wetland	Total
Marina/Boating Sanitary On-vessel Discharges	7				7
Freshets or Major Flooding	5			1	6
Sources Outside State Jurisdiction or Borders	6				6
Flow Alterations from Water Diversions	5				5
Forced Drainage Pumping	5				5
Naturally Occurring Organic Acids	5				5
Upstream Source	4	1			5
Construction Stormwater Discharge (Permitted)	3	1			4
Silviculture Harvesting	3	1			4
Algae Bloom		3			3
Contaminated Sediments	2	1			3
Industrial/Commercial Site Stormwater Discharge (Permitted)	1	2			3
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	1		2		3
Residential Districts	3				3
CERCLA NPL (Superfund) Sites	2				2
Impacts from Hydrostructure Flow Regulation/modification	2				2
Municipal (Urbanized High Density Area)	2				2
Nonpoint Source	1		1		2
Petroleum/natural Gas Activities	2				2
Wet Weather Discharges (Nonpoint Source)	1		1		2
Animal Feeding Operations (NPS)	1				1
Changes in Tidal Circulation/Flushing	1				1
Drainage/Filling/Loss of Wetlands	1				1
Dredging (E.g., for Navigation Channels)	1				1
Highways, Roads, Bridges, Infrastructure (New Construction)	1				1
Managed Pasture Grazing	1				1
Manure Runoff	1				1
Non-irrigated Crop Production	1				1
Pesticide Application		1			1
Sand/gravel/rock Mining or Quarries	1				1

Table 1.1.3

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2016 Louisiana Integrated Report* assessment.

Suspected Sources of Impairment	River	Lake	Estuary	Wetland	Total
Seafood Processing Operations	1				1
Streambank Modifications/destabilization		1			1
Transfer of Water from an Outside Watershed	1				1
Unrestricted Cattle Access	1				1
Unspecified Land Disturbance		1			1

The high number of low DO impairments reported in Table 1.1.2 are due in part to natural conditions but may also be related to high loadings of material that lead to the reduction of oxygen levels in the water. These materials come from a variety of sources including sewage, fertilizers, some sediments, and naturally high levels of plant material in swampy areas.

Twenty-three different categories were reported as suspected sources of subsegment impairment by fecal coliform. In rank order they include: on-site treatment systems (septic systems) (61 subsegments); package plant or other permitted small flows discharges (33); sewage discharges in unsewered areas (22); wildlife other than waterfowl (18); waterfowl (17); natural sources (14); livestock (grazing or feeding operations) (13); municipal point source discharges (11); sanitary sewage overflows (10); rural residential areas (8); source unknown (8); marina/boating sanitary on-vessel discharges (7); runoff from forest/grassland/parkland (7); drought-related impacts (6); agriculture (2); discharges from municipal separate storm sewer systems (MS4) (2); animal feeding operations (NPS) (1); industrial point source discharge (1); managed pasture grazing (1); manure runoff (1); nonpoint source (1); unrestricted cattle access (1); and upstream source (1). Eleven of the 23 sources identified above are related to nonpoint sources of pollution; highlighting the impact NPS can have on water quality.

Mercury in Louisiana water bodies is largely derived from atmospheric deposition by natural sources and coal-fired power plants, as opposed to direct discharges to water from land based facilities. Pirrone et al. (2010) estimated that global natural sources are responsible for 5,207 Mg (Mg = 1,000 kg or 1 metric ton) of mercury released to the atmosphere annually. Roughly half of this naturally released mercury derives from ocean emissions, with the remainder coming primarily from (1) lakes, soil and plant emissions; (2) biomass burning; and (3) volcanoes and geothermal areas. An estimated 2,320 Mg of mercury is emitted directly from anthropogenic sources. Of this total, approximately 810 Mg (35%) is from coal and oil combustion. Artisanal gold mining accounts for 400 Mg (17%), while 310 Mg (13.4%) is from non-ferrous metal production. The eight remaining individual sources collectively account for approximately 35% of total anthropogenic sources (Pirrone et al. 2010). Based on the preceding estimates, approximately 69% of all annual worldwide mercury emissions to the atmosphere are derived from natural sources. Taking this into account, the primary sources of mercury in Louisiana waters are most likely national or international in origin and, therefore, largely outside the scope of LDEQ control. More information on mercury in Louisiana can be found at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=287.

High turbidity, the fifth most frequently cited cause of impairment may be caused by poor farming and forestry practices, as well as runoff from construction sites. It can also be naturally occurring in some areas. Chlorides, sulfates, and TDS (collectively referred to as "minerals") are also frequently cited as suspected causes of FWP impairment. Many cases of reported minerals criteria failures may be due to saltwater intrusion in coastal areas. Saltwater from the Gulf of Mexico has naturally higher concentrations of these substances than the freshwater flowing into coastal areas. Water quality criteria for these substances were in some areas originally based on more freshwater conditions; therefore, as coastal areas erode and saltwater intrudes, areas with normally fresher water are now experiencing more brackish (salty) conditions. This results in more minerals criteria exceedances.

A large percentage of the reported suspected sources of impairment are related to what is collectively known as nonpoint source pollution. NPS pollution is caused by the runoff of stormwater from land such as agricultural fields, forestry areas, construction sites, and urban areas. In contrast, Point Sources (PS) of water pollution are those from a discrete pipe such as a small or large industrial discharger or municipal sewage treatment plant. With this distinction in mind, a large percentage of Louisiana subsegments, 191 (40%), are impacted by NPS related sources (see Table 1.1.3). A total of 101 subsegment source listings were possibly related to point source discharges. Forty-four subsegments were suspected to be impaired by sources related to aquatic invasive species, while a variety of naturally occurring conditions accounted for 192 suspected subsegment impairments. Each subsegment may be impaired by multiple sources including NPS, PS, natural, and/or a variety of other types of sources. Part II, Chapter 2 provides more information on NPS pollution and Louisiana's efforts to control it.

Although Louisiana has a large industry sector, only 24 subsegments out of 478 have reported suspected sources of impairment related to industrial activities. Many of these suspected industrial sources are the result of legacy pollutants which have been or are in the process of being remediated (Part III, Chapter 2 Integrated Report Category 4b Documentation). While industrial activities are certainly a factor impacting Louisiana's water quality, assessments indicate it is not as prevalent as is frequently believed by the public. This is due in large part to stringent CWA and Louisiana Environmental Quality Act (LEQA) (LEQA 1995) permitting and enforcement directed at point source dischargers to Louisiana's water bodies. Part II, Chapter 2 contains more information on water quality permitting and enforcement in Louisiana.

Summary of River Quality in Louisiana

Figures 1.1.2 through 1.1.4 summarize support of the three most common designated uses for Louisiana rivers. The uses are PCR, SCR, and FWP. Each subsegment may have more than one designated use. Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 3. Summary tables for the suspected causes and sources of impairment to Louisiana's rivers can also be found in Part III, Chapter 3. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.2.

Support for primary contact recreation (swimming) for Louisiana rivers, 2016 Integrated Report assessment. (Based on 332 assessed rivers)

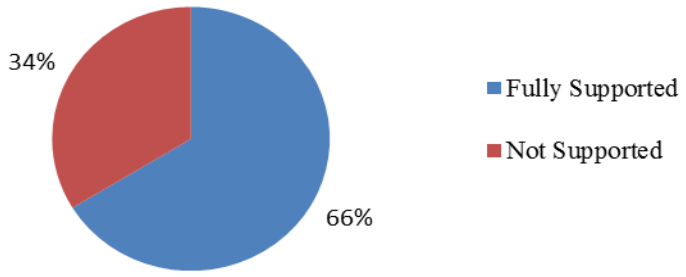


Figure 1.1.3.

Support for secondary contact recreation (boating) for Louisiana rivers, 2016 Integrated Report assessment. (Based on 344 assessed rivers)

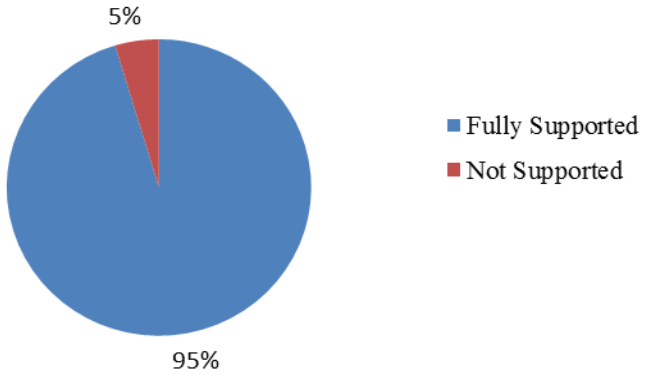
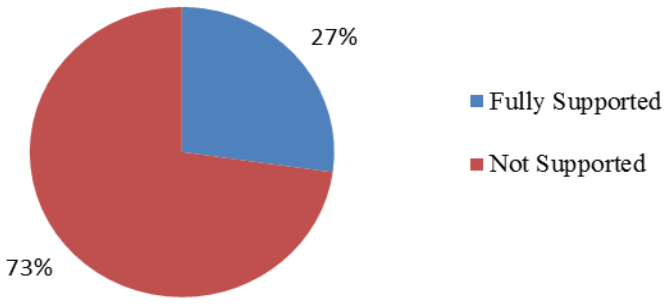


Figure 1.1.4.

Support for fish and wildlife propagation (fishing) for Louisiana rivers, 2016 Integrated Report assessment. (Based on 338 assessed rivers)



Summary of Lake Quality in Louisiana

Figures 1.1.5 through 1.1.7 summarize support of PCR, SCR, and FWP in Louisiana lakes. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these other uses can be found in Part III, Chapter 4. Summary tables for the suspected causes and sources of impairment to Louisiana's lakes can also be found in Part III, Chapter 4. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.5.

Support for primary contact recreation (swimming) for Louisiana lakes, 2016 Integrated Report assessment. (Based on 62 assessed lakes)

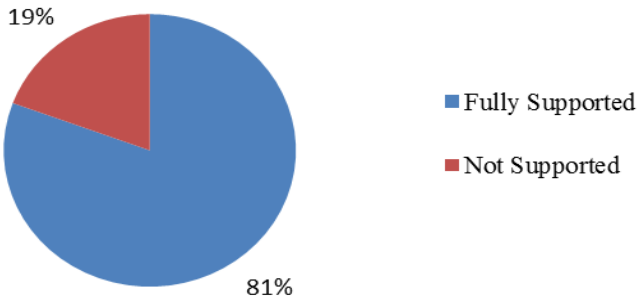


Figure 1.1.6.

Support for secondary contact recreation (boating) for Louisiana lakes, 2016 Integrated Report assessment. (Based on 62 assessed lakes)

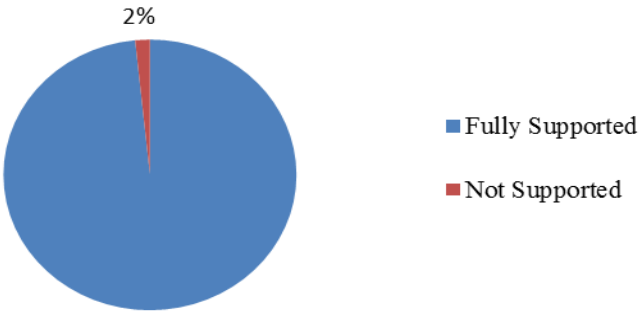
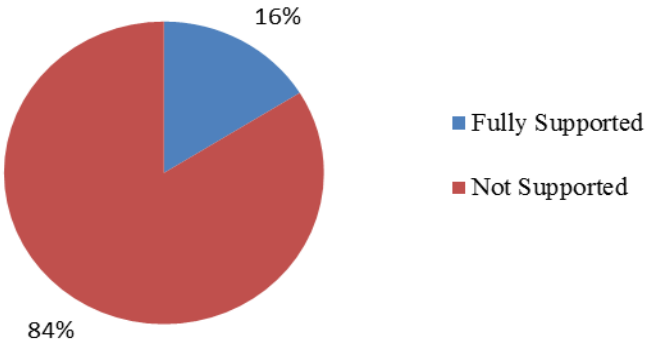


Figure 1.1.7.
Support for fish and wildlife propagation (fishing) for Louisiana lakes, 2016 Integrated Report assessment. (Based on 62 assessed lakes)



Summary of Estuary Quality in Louisiana

Figures 1.1.8 through 1.1.10 summarize support of PCR, SCR, and FWP for Louisiana estuaries. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 5. Summary tables for the suspected causes and sources of impairment to Louisiana's estuaries can also be found in Part III, Chapter 5. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.8.

Support for primary contact recreation (swimming) for Louisiana estuaries, 2016 Integrated Report assessment. (Based on 52 assessed estuaries)

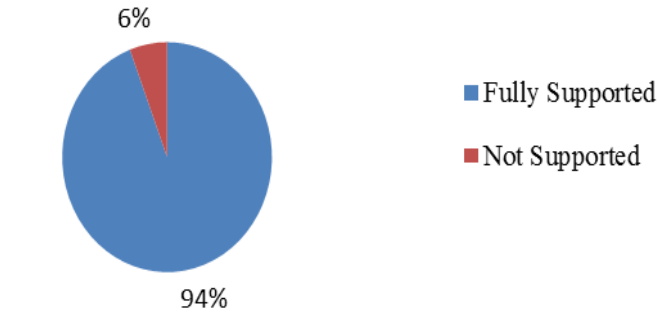


Figure 1.1.9.

Support for secondary contact recreation (boating) for Louisiana estuaries, 2016 Integrated Report assessment. (Based on 52 assessed estuaries)

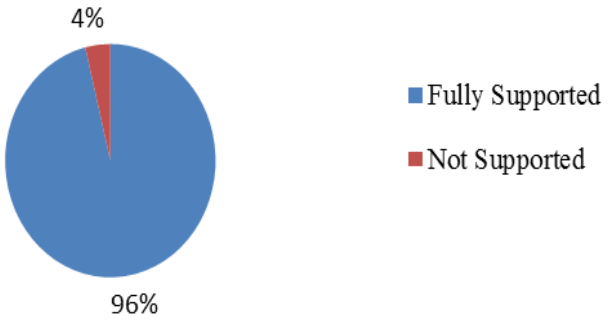
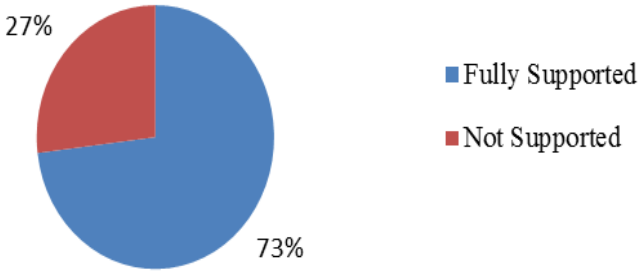


Figure 1.1.10.

Support for fish and wildlife propagation (fishing) for Louisiana estuaries, 2016 Integrated Report assessment. (Based on 52 assessed estuaries)



Summary of Wetland Quality in Louisiana

Figures 1.1.11 through 1.1.13 summarize support of PCR, SCR, and FWP in Louisiana wetlands. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 6. Summary tables for the suspected causes and sources of impairment to Louisiana's wetlands can also be found in Part III, Chapter 6. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.11.

Support for primary contact recreation (swimming) for Louisiana wetlands, 2016 Integrated Report assessment. (Based on 6 assessed wetlands)

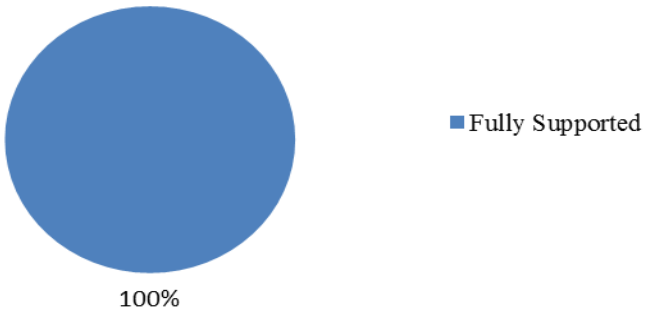


Figure 1.1.12.

Support for secondary contact recreation (boating) for Louisiana wetlands, 2016 Integrated Report assessment. (Based on 6 assessed wetlands)

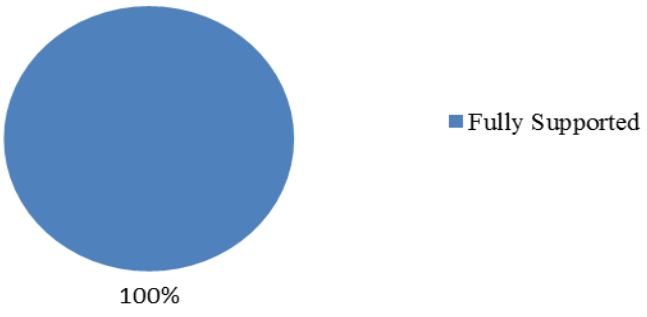
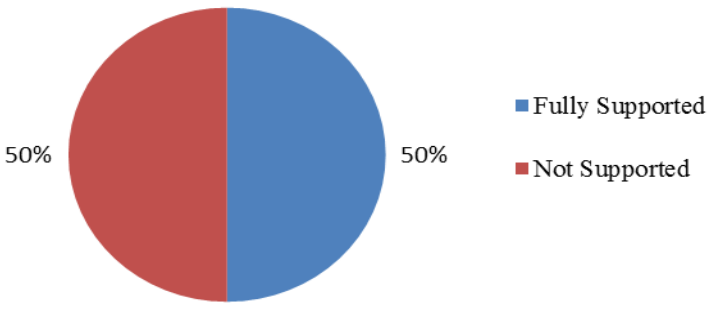


Figure 1.1.13.
Support for fish and wildlife propagation (fishing) for Louisiana wetlands, 2016 Integrated Report assessment. (Based on 6 assessed wetlands)



Surface Water Pollution Control Programs

LDEQ has the responsibility of managing the quality of Louisiana's surface waters by implementing pollution control measures and protecting the integrity of those waters where good quality exists. Water pollution controls employed by the agency include establishing water quality standards, conducting intensive surveys, developing TMDLs, writing municipal and industrial wastewater discharge permits, inspecting facilities, responding to complaints and incidents, enforcing permit requirements, reviewing and certifying projects affecting water quality, promoting use of best management practices (BMPs) for NPS pollution, and regular water quality monitoring and assessment of the state's surface waters. More information on LDEQ's surface water pollution control programs can be found in Part II, Chapter 2.

Groundwater Quality in Louisiana

The LDEQ Business Community Outreach and Incentive Division's (BCOID) Aquifer Sampling and Assessment (ASSET) Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers, and provides water quality data on these aquifers. Through this Program samples are collected from approximately 200 water wells located in 14 aquifers across the state. The sampling process is designed so that all 14 aquifers are monitored on a rotating basis, within a three-year period, so that each well is monitored every three years.

The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. For this report, fiscal year 2015 ASSET Program monitoring data from the Southern Hills Aquifer System is presented. Details regarding the Southern Hills Aquifer System can be found in Part IV of this report.

PART II: BACKGROUND

Chapter 1: Louisiana Resources

Louisiana Geography and Climate

Louisiana lies entirely in the Gulf Coastal Plain physiographic province and can be divided into five natural physiographic regions: Coastal Marsh, Mississippi Alluvial Valley, Red River Valley, Terraces, and Hills. The state has 12 major watershed basins, which are described in Appendix A (Figure 2.1.1). Maximum elevations in Louisiana are located in the hills of the northwest, where the state's oldest geologic formations are found. The highest elevation in the state is only 535 feet. The lowest elevations in the state are found in the Coastal Marsh area, which extends across the southern portion of Louisiana and represents a valuable fisheries and wildlife resource. Due to levee construction, marsh filling, and subsidence, portions of south Louisiana are below sea level. Because Louisiana's coastal resources differ significantly in physical, chemical, and hydrological characteristics from inland resources, the atlas information provided below for lakes and wetlands has been broken down into two categories: inland and coastal (Table 2.1.1). Those categorized as coastal receive some tidal influx, even though some of the coastal lakes and wetlands are characterized by freshwater vegetation.

Louisiana has a humid subtropical climate influenced by the extensive landmass to the north, the Gulf of Mexico to the south, and the subtropical latitude. Prevalent winds from the south/southeast bring in warm, moist air from the Gulf, resulting in abundant rainfall. The statewide annual average precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux.

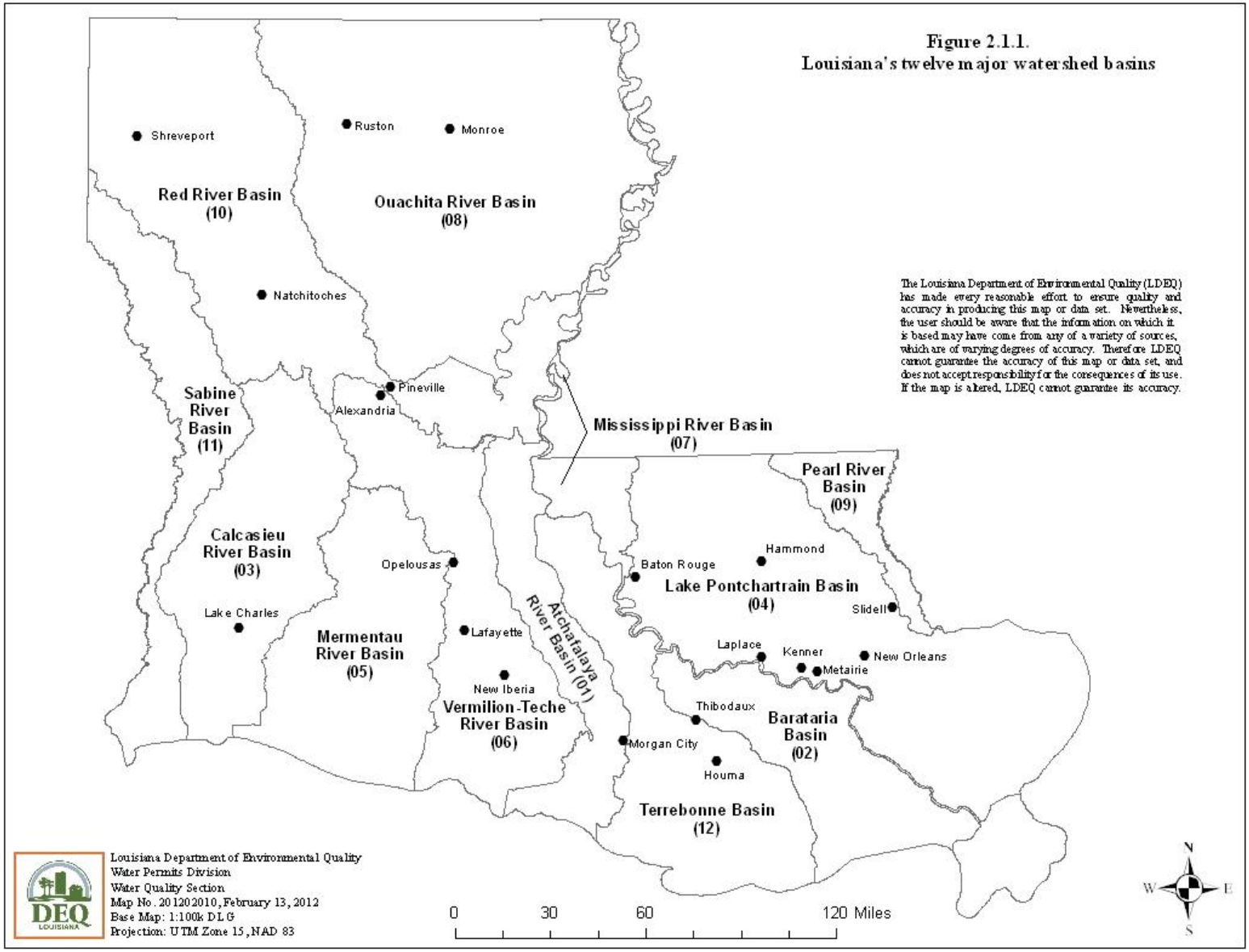


Figure 2.1.1.
Louisiana's twelve major watershed basins
Shreveport
Ruston
Monroe
Red River Basin (10)
Ouachita River Basin (08)
Natchitoches
Sabine River Basin (11)
Pineville
Alexandria
Mississippi River Basin (07)
Pearl River Basin (09)
Calcasieu River Basin (03)
Opelousas
Hammond
Baton Rouge
Lake Pontchartrain Basin (04)
Slidell
Lake Charles
Mermentau River Basin (05)
Lafayette
Atchafalaya River Basin (01)
Laplace
Kenner
New Orleans
Metairie
New Iberia
Vermilion-Teche River Basin (06)
Thibodaux
Barataria Basin (02)
Morgan City
Houma
Terrebonne Basin (12)
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
Louisiana Department of Environmental Quality
Water Permits Division
Water Quality Section
Map No. 20120210, February 13, 2012
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83
0 30 60 120 Miles
N
W E
S

Table 2.1.1

Geophysical data for Louisiana.

State Population (2015 population estimate http://quickfacts.census.gov/qfd/states/22000.html)	4,670,724
State Surface Area (Land)[1] (square miles)	43,204
Percent Land	82.5%
State Surface Area (Water)[1] (square miles)	9,174
Percent Water	17.5%
Major River Basins	12
Rivers: (miles)	
Total River Miles	66,294
Perennial	32,955
Intermittent	20,667
Ditches/Canals	12,672
Border Miles: (miles)	
Names and Mileage of Border Rivers	
Total Mileage	484
Pearl River	74
Mississippi River	200
Sabine River (includes Toledo Bend Reservoir)	210
Lakes:	
Total Number of Fresh Water Lakes/Reservoirs	6,603
Total Acres of Fresh Water Lakes/Reservoirs	1,078,031
Number of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi.	62
Acres of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi.	474,506 acre
Number of Coastal Fresh Water Lakes/Reservoirs	39
Acres of Coastal Fresh Water Lakes/Reservoirs	239,213
Wetlands: (acres)	
Fresh Water Inland Wetlands	3,000,130
Coastal Wetlands (LDWF 2001)	4,088,789
Swamp	467,821
Fresh Marsh	1,215,656
Intermediate Marsh	901,441
Brackish Marsh	812,334
Salt Marsh	691,537
Estuaries/Bays: (square miles)	7,656
Coastal Miles:	397
Total Miles of Shoreline: (includes islands, bays, rivers and bayous up to head of tide water)	7,721

[1] As of January 1, 2010 - U.S. Census Bureau. https://www.census.gov/geo/reference/state-area.html:

Chapter 2: Water Pollution Control Program

Watershed Approach

LDEQ reports on water quality in the state by basin subsegment. Subsegments are smaller watersheds or portions of watersheds within the 12 larger basins of the state. Louisiana is divided into 12 major watershed basins (Figure 2.1.1), and each basin is further divided into water body subsegments. This subsegment approach divides the state's waters into discrete hydrologic units. The plan for this approach was presented in the 1978 Water Quality Management Plan and underwent a major revision in 1985 to increase hydrologic consistency within each named subsegment. The final draft of the Louisiana Basin and Subsegment Boundaries plan was completed in 1990 and is reviewed periodically to ensure that subsegments are distinct and consistent representations of the state's hydrology. The current version was completed in November 2014. The water body subsegment system within each watershed basin provides a workable framework for evaluation of the state's waters. Subsegments are periodically added or removed as water quality standards related to a subsegment or group of subsegments are revised. Adding or removing subsegments requires detailed analysis and justification prior to revision in LAC 33:IX.1123.

Water Quality Standards Program

Louisiana's water quality standards are the foundation of LDEQ's water quality management and pollution control programs. Water quality standards are based on national goals outlined in the CWA (formally referred to as the 1972 Federal Water Pollution Control Act), Sections 101 and 102, and are authorized by Section 303 of the CWA and subsequent amendments, the Louisiana Water Control Law (Title 30, Chapter 4 of Louisiana's revised statutes) and the supporting federal regulations found in Title 40, Part 131 of the Code of Federal Regulations (40 CFR 131). Louisiana's water quality standards are adopted as state regulations applicable to surface waters of the state and are contained in Title 33 of the LAC, Part IX, Chapter 11 (LAC 33:IX.1101 et seq., as amended). The water quality standards provide the basis for implementing the state's CWA programs, including water quality assessments and TMDL determinations outlined in the CWA, Sections 303(d) and 305(b), water discharge permitting conducted in conformance with Section 402, NPS pollution management strategies conducted under Section 319, and certification of federal activities in state waters as outlined in Section 401.

The minimum federal regulatory requirements for state water quality standards (40 CFR 131.6) are: (1) the designation of uses consistent with the CWA; (2) the methods and analyses used to revise standards; (3) criteria sufficient to support the designated uses; (4) an antidegradation policy; (5) certification by the appropriate state legal authority that water quality standards revisions are adopted in accordance with state law; and (6) general information concerning the acceptability of the scientific basis for standards and policies not covered under the CWA (e.g., variances).

Designated Uses and Water Quality Criteria

Section 101 of the CWA outlines a national goal of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, provides for recreation in and on the water, and prohibits the discharge of toxic pollutants in toxic amounts. Section 102 of the CWA further

outlines that water quality protection programs consider the use of waters for public water supply, agricultural, industrial, and other purposes, including navigation. These goals are also outlined in the federal regulations (40 CFR 131.2).

To achieve the national goals, all Louisiana water bodies were originally assigned or designated uses consistent with CWA mandates that were applied statewide. Criteria to support these designated uses were also assigned statewide in response to federal regulations promulgated to achieve CWA goals. The designated uses adopted for Louisiana's surface waters are: primary contact recreation; secondary contact recreation; fish and wildlife propagation (including a subcategory for limited aquatic life and wildlife); drinking water supply; oyster propagation; agriculture; and outstanding natural resource waters (LAC 33:IX.1111.A).

These uses, along with the total size for each use and water body type combination are shown in Table 2.2.1. Designated uses are established in LAC 33:IX.1123 et seq. The sizes found in Table 2.2.1 are not reflective of the total size for water bodies listed in the Table 2.1.1, above. Rather, these sizes are only for the named water bodies listed as "subsegments" in LAC 33:IX.1123 et seq. Subsegments are watersheds or portions of watersheds delineated as management units for water quality standards, monitoring, assessment, modeling, permitting, surveying, and enforcement purposes.

Table 2.2.1

Total sizes of Louisiana water bodies classified for various designated uses (Louisiana Environmental Regulatory Code 33:IX.1123).

	Water Body Type			
Classified Uses	**Rivers (miles)**	**Lakes (acres)**	**Estuaries (sq. miles)**	**Wetlands (acres)**
Primary Contact Recreation	9,193	658,210	4,954	1,025,280
Secondary Contact Recreation	9,357	658,210	4,954	1,077,053
Fish and Wildlife Propagation	9,267	658,210	4,954	1,077,053
Drinking Water Supply	1,069	262,414	-0-	464,000
Outstanding Natural Resource Waters	1,587	-0-	-0-	-0-
Oyster Propagation	470	-0-	4,268	72,320
Agriculture	2,044	425,998	-0-	-0-
Limited Aquatic Life and Wildlife Use	90	-0-	-0-	-0-

Water quality criteria are elements of state water quality standards expressed as constituent concentrations, levels, or narrative statements representing the quality of water protective of the designated use(s). Louisiana adopted general (narrative) and numeric criteria to protect the designated uses of state waters (LAC 33:IX.1113). General criteria are expressed in a narrative form and include descriptions for aesthetics, color, suspended solids, taste and odor, toxic substances, oil and grease, foam, nutrients, turbidity, flow, radioactive materials, and biological and aquatic community integrity. Numeric criteria are generally expressed as concentrations (e.g., weight measured per liter) or scientific units and include pH, chlorides, sulfates, TDS, DO, temperature, bacteria, and specific toxic substances. USEPA published guidance or national

criteria recommendations for a number of substances, and a state may incorporate these without modification into its water quality standards.

Human health criteria provide guidelines that specify the potential risk of adverse effects to humans due to substances in the water. Factors considered include body weight, risk level, fish consumption, drinking water intake, and incidental ingestion while swimming. Categories of criteria are then developed for each toxic substance for drinking water supplies and non-drinking water. Primary and secondary contact recreation exposures are protected under both drinking water supplies and non-drinking water criteria.

Aquatic life criteria are designed to protect fish and wildlife propagation use, including plants and animals. There are two types of criteria: "acute" for short-term exposure, and "chronic" for long-term exposure. Separate criteria are also developed for fresh and salt waters. Listings of specific toxic criteria for protection of human health and aquatic life for Louisiana are found in LAC 33:IX.1113.C.6.Table 1.

The development of national aquatic life and human health criteria is a dynamic process that takes into consideration the most recent and best defensible, scientific information available. Since the establishment of designated uses and criteria based on national goals, state and federal agencies have recognized the need to establish site-specific or regional standards that may account for a state's unique water quality. A state may make a determination on whether the designated uses are attainable. A designated use that is not an existing use may be removed if it is demonstrated through a Use Attainability Analysis (UAA) that the designated use is not feasible due to one or more of the following reasons (LAC 33:IX.1109.B.3):

1. Naturally occurring pollutant concentrations prevent the attainment of the use.
2. Natural, ephemeral, intermittent, or low flow conditions prevent the attainment of the use.
3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.
4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the original conditions.
5. Physical conditions related to the natural features of the water body (e.g., proper substrate) preclude attainment of aquatic life use protection.
6. Controls more stringent than those required by Sections 301(b) or 306 of the CWA would result in substantial and widespread economic and social impact.

According to the regulations, a UAA is defined as "a structured scientific assessment of the factors (chemical, physical, biological, and economic) affecting the attainment of designated water uses in a water body." (see also LAC 33:IX.1105 and 40 CFR 131.3(g)). The UAA process entails the methodical collection of data that is scientifically analyzed, summarized, and used to make recommendations for site-specific uses, and the criteria to support the uses. Acceptable methods used in conducting the UAA process are described in USEPA guidance documents.

Several water bodies in Louisiana have site-specific criteria and uses based on UAAs developed in coordination with USEPA (see endnotes in LAC 33.IX.1123.Table 3).

Additionally, a state may determine that, while all original designated uses may be supported, the water quality criteria adopted to protect those uses may not be appropriate. In such instances, a state may compile technical documentation to justify a criteria refinement while not conducting a comprehensive UAA. A state is allowed the flexibility to develop, adopt and implement state-specific criteria provided there is sufficient justification and technical documentation to support the criteria refinements.

Technical support documentation and/or UAAs for site-specific criteria and/or uses may be developed for a specific water body, water body type (e.g., wetlands), ecological region (ecoregion), or watershed. LDEQ recently used an ecoregion and "least-impacted" reference water body approach to establish water quality criteria within an ecoregion. Ecoregions are management units which are spatially grouped ecological regions with similar physical, chemical, and biological characteristics.

Nutrient Standards Development

The *Clean Water Action Plan*, a federal initiative announced in 1998, outlines development of numerical nutrient criteria as an action item. Louisiana continues to work with USEPA to collect information that will inform nutrient criteria development and implementation. USEPA recognizes that "one size fits all" nutrient criteria are not appropriate and recommends that each state's nutrient criteria be water body-specific (e.g., lakes, rivers and streams, estuaries, etc.) and applicable within an appropriate ecoregional framework.

USEPA published a series of guidance documents that outlined approaches to setting nutrient criteria; the approaches included deriving criteria based on an ecoregion-water body type approach or using stressor-response studies to derive protective levels. In November 2001, USEPA issued guidance in the form of a memorandum that clarified the flexibility that states have in development of defensible nutrient criteria.

LDEQ is proceeding in its efforts to develop scientifically defensible and appropriate nutrient criteria for Louisiana's water bodies. By working closely with the academic community, the U.S. Geological Survey (USGS) and others, LDEQ is able to incorporate the latest scientific research into defensible approaches to nutrients, including collecting and evaluating data from nutrient stressor-response studies. LDEQ also continues to inform and seek input from stakeholders about nutrient management for Louisiana's water bodies through implementation of the state's multi-agency Louisiana Nutrient Management Strategy. LDEQ is currently an active member on USEPA's Hypoxia Task Force and participates in Gulf of Mexico Alliance (GOMA) activities.

LDEQ is proceeding with assimilation and analysis of data collected in 2012 and 2013 as part of an inland rivers and streams stressor-response study using an ecoregional approach. The goal of the study is to inform development of numeric nutrient criteria for inland rivers and streams. LDEQ collected habitat, water quality (including nutrients), macroinvertebrate, fish, and algal data along a gradient of nutrient impacts from 60 sites within the South Central Plains Flatwoods (SCPF), the South Central Plains Southern Tertiary Uplands (SCPSTU), the South Central Plains Tertiary Uplands (SCPTU), the Terrace Uplands (TU), and the Upper Mississippi River Alluvial Plains (UMRAP) Ecoregions.

Nutrient Gradient Study

The department's endeavor to develop scientifically defensible and appropriate numeric nutrient criteria is proceeding with assimilation and analysis of data collected in 2012 and 2013 as part of an inland rivers and streams stressor-response study using an ecoregional approach. The goal of the study is to inform development of numeric nutrient criteria for inland rivers and streams. LDEQ collected habitat, water quality (including nutrients), macroinvertebrate, fish, and algal data along a gradient of nutrient impacts from 60 sites within the South Central Plains Flatwoods (SCPF), South Central Plains Southern Tertiary Uplands (SCPSTU), South Central Plains Tertiary Uplands (SCPTU), Terrace Uplands (TU), and the Upper Mississippi River Alluvial Plains (UMRAP) Ecoregions.

Ecoregions Standards Development

Appropriate levels of oxygen in water bodies are necessary for the respiration of aquatic life. Although a primary constituent of water, the oxygen contained in a water molecule is unavailable to biota due to chemical bonding; it must be present in its dissolved atmospheric form (O2) to be of use. The amount of DO that is needed can vary among organisms, their associated habitats, ecosystems, and regions. The concentration of DO present in a water body depends on atmospheric and photosynthetic inputs, metabolism of aquatic biota, physical processes, and environmental variables.

When adopting or revising water quality criteria to establish or reflect site-specific conditions, a determination of attainable uses and criteria for a specific water body may be based on comparisons made between the water body of interest and a "least-impacted" control or "reference" water body, or on the basis of background conditions of reference water bodies. Because of the similarity and homogeneity of ecological characteristics such as climate, land use, soil type, land surface form, flora, fauna and hydromodification within an ecoregion, watersheds may be managed on an ecoregional level. Specifically, the ecoregion-based approach may be used to develop regional or even site-specific water quality criteria, management strategies, and implementation plans for water resources.

With the support of USEPA, LDEQ has begun using least-impacted reference sites and an ecoregional approach to refine or establish appropriate DO criteria on a more regional basis in Louisiana. Criteria for the different water body types (e.g., streams, lakes, bays, canals, etc.) will be established while accounting for the natural characteristics of Louisiana's ecoregions.

In 2009, LDEQ adopted revised DO criteria on an ecoregional basis for several water body types throughout the Barataria and Terrebonne Basins (LDEQ 2008a). This DO criteria refinement resulted from the *Use Attainability Analysis of Barataria and Terrebonne Basins for Revision of Dissolved Oxygen Water Quality Criteria*, commonly referred to as the BT UAA.

Eastern LMRAP Revisions

LDEQ continued the effort to refine DO criteria on an ecoregional basis in 2015 with the Use Attainability Analysis of Inland Rivers and Streams in the Eastern Lower Mississippi River Alluvial Plains Ecoregion for Review of Dissolved Oxygen Water Quality Criteria (i.e., the eastern LMRAP UAA). The eastern Lower Mississippi River Alluvial Plains (LMRAP) Ecoregion study re-evaluated the DO criteria and the critical period in the eastern portion of the LMRAP Ecoregion by using a qualitative and quantitative ecological comparison with the

western portion of the ecoregion in which DO criteria and critical period refinements had already been well established through the BT UAA. In December 2015, based on the findings presented in the eastern LMRAP UAA, the DO criteria was revised in 31 subsegments in the eastern LMRAP Ecoregion. The DO criteria for those 31 subsegments is now 2.3 mg/L DO from March through November and 5.0 mg/L DO from December through February. The department will continue the effort to re-evaluate and establish more regionally appropriate DO criteria in Louisiana water bodies in other ecoregions within the state. Water quality assessments based on the revised LMRAP Ecoregion DO criteria are expected to be incorporated in the 2018 IR.

Coastal Recreation Criteria

The CWA, as amended by the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2000, requires each state having coastal recreation waters to adopt and submit to the USEPA water quality criteria for those pathogens and pathogen indicators for which USEPA has published criteria under CWA 304(a). Coastal recreation waters are defined as "(i) the Great Lakes; and (ii) marine coastal waters (including coastal estuaries) that are designated under CWA Section 303(c) by a state for use for swimming, bathing, surfing, or similar water contact activities" (USEPA 2000). Louisiana has marine coastal waters that are designated as primary contact recreation (e.g., swimming) waters; therefore, Louisiana is bound by the requirements of the BEACH Act.

Previous to the 2000 BEACH Act, USEPA had published recommended enterococci pathogen criteria for protection of marine recreational waters in 1986. Louisiana did not adopt updated pathogen criteria based on the 1986 recommendations and therefore USEPA promulgated coastal pathogen criteria for Louisiana, and 20 other states, in 2004 (USEPA 2004). Pursuant to the BEACH Act, USEPA updated pathogen criteria to protect recreational waters and published the updated recommendations in December 2012 (USEPA 2012). USEPA again recommended the use of enterococci criteria in marine waters (USEPA 2012) and therefore Louisiana must adopt updated pathogen criteria for its marine coastal waters or risk promulgation of federal criteria by the USEPA. Therefore, the LDEQ is proposing to adopt enterococci criteria for its coastal marine and estuarine recreation waters. LDEQ anticipates the proposed criteria will be published for public comment February 20, 2016. The adoption of the proposed enterococci criteria will provide for: (i) an expanded definition of illness; (ii) the ability to capture more illness-causing pathogens in the testing methods; and (iii) the use of a multi-criteria system when and where fecal coliform criteria still apply. Each one of these factors, together or on its own, provides for an improved public health protection monitoring program.

Minerals Criteria Review

Louisiana's numeric water quality criteria for minerals, specifically chloride, sulfate and TDS, were last revised in 1994. Other than the site-specific Use Attainability Analyses that have demonstrated minerals levels are protective of designated uses, LDEQ's minerals criteria were not established with a direct connection to support a particular designated use. Therefore, LDEQ began a review of the numeric water quality criteria for minerals. A detailed report reviewing the minerals criteria was completed in March 2016. The purpose of this report was to: compile a comprehensive dataset of minerals-related water quality parameters from several LDEQ projects; establish a range of mineral ion components in state waters; and provide a foundation for future minerals-related water quality standards development. Nineteen water quality parameters (alkalinity, bicarbonate, calcium, chloride, fluoride, hardness, iron, magnesium, manganese,

nitrate-nitrite, pH, phosphorus, potassium, salinity, silica, sodium, specific conductivity, sulfate, and total dissolved solids) were characterized with descriptive statistics by ecoregion, river basin and waterbody type.

Turbidity Criteria in Pearl River Review

LDEQ is currently evaluating the turbidity criterion of two subsegments in the Pearl River Basin. The two subsegments, LA090205_00 (Wilson Slough–From Bogue Chitto to West Pearl River (Scenic), and LA090206_00 (Bradley Slough–From Bogue Chitto to West Pearl River (Scenic), are both designated as Outstanding Natural Resource Waters (ONRs) with a 25 NTU (nephelometric turbidity units) turbidity criterion (LAC 33:IX.1113.B.9.b.v). An issue exists with the turbidity criterion in the two subsegments since the Pearl River furnishes over 80% of the water flowing into Wilson Slough; with the Pearl River having a turbidity criteria of 50 NTU. The evaluation and probable revisions should resolve the turbidity issue in the two subsegments.

Methods and Analyses Used to Revise Standards

Section 303(c) of the CWA requires a state to hold public hearings at least once every three years for the purpose of reviewing its water quality standards and to revise or adopt standards as needed. The CWA also requires USEPA to ensure that a state's standards are consistent with the CWA.

Louisiana's Surface Water Quality Standards provide that "standards are not fixed for all time, but are subject to future revision…" (LAC 33:IX.1109.H). Revision to the water quality standards occurs routinely as new data and information become available. Water quality standards are reviewed to ensure criteria remain protective of existing conditions and uses and for future water quality management goals.

Part of the review process includes an assessment of the state's numeric water quality criteria for toxic pollutants and the occurrence of toxic pollutants in state waters. Technical sources of information are reviewed in order to establish the appropriate criteria for pollutants. The review takes into consideration many factors, including the state's current water quality condition, designated uses, violation summaries, wastewater discharge summaries, toxics release inventory (TRI) data, survey data, and other pertinent information. LDEQ has adopted numeric water quality criteria for toxic pollutants based on known or suspected occurrence of the substances in Louisiana waters and potential threat to attainment of designated uses.

Based on LDEQ's review of the existing water quality standards, recent USEPA guidance and policies, and public comments, revisions may include, but are not limited to:

- New toxic or other criteria
- Modifications to designated uses
- Subsegment delineations and/or description revisions (e.g., corrections and changes)
- Clarifications to regulatory language
- Updates to water quality policies

The water quality standards revision process involves procedures for thorough technical review of USEPA-recommended policy and criteria, review by state and federal agencies and the public, final approval by USEPA, promulgation of the revisions into regulations, and certification by the state legal authority (see Certification of Standards by State Legal Authority, below) that the

standards revision and regulation development process meets all applicable state laws and regulations.

Antidegradation Policies

The CWA and federal regulations require all states to have an antidegradation policy and to identify the methods for implementing the policy (40 CFR. 131.12). Louisiana's Antidegradation Policy (the Policy) and Implementation Plan (the Plan) are contained in the Surface Water Quality Standards (LAC 33:IX.1109.A and 1119). The Policy and Plan provide the basis for the protection of state waters from activities that may cause degradation of the water quality and impairment of the existing and designated uses. The Antidegradation Policy and Implementation Plan have been approved by USEPA-Region 6 and meet the requirements of the federal regulations. LAC 33:IX.1119 specifies that implementation procedures and methods will be included in the Continuing Planning Process, with additional Water Quality Management Plan documentation developed as needed. LDEQ has been working with USEPA-Region 6 to develop more detailed implementation procedures, in part, to fulfill federal and state regulatory requirements, as well as to provide specific guidance to permit applicants and consolidate all specific procedures related to antidegradation into one document.

Certification of Standards by State Legal Authority

In accordance with § 303(c) of the CWA and the certification process outlined in 40 CFR 131.21, an official copy of the final regulation, as published in the Louisiana Register, is submitted, by LDEQ's Executive Counsel, to USEPA-Region 6. USEPA will either approve or disapprove the state-adopted water quality standard, and only a USEPA-approved standard is suitable for CWA implementation.

Basis for Standards and Policies Not Covered by the CWA

The Louisiana Water Quality Standards, in addition to meeting minimum federal and state water quality protection requirements, contain standards and policies that are not driven by federal statute or regulation. The additional standards and policies include, but are not limited to: allowance for compliance schedules, variances, and short term activity authorizations; classification of non-perennial and other water body types such as manmade water bodies; establishment of critical flows for water quality assessments and permitting activities; allowance of mixing zones for permitted dischargers; and implementation policies and procedures for general criteria.

Water Quality Monitoring and Assessment Program

LDEQ conducts extensive surface and groundwater sampling throughout Louisiana in order to obtain information regarding the quality of Louisiana's surface water and groundwater resources. Data obtained from this program is used to develop reports, including the *2016 Water Quality Inventory: Integrated Report*, in order to inform the public, state agencies, and federal agencies about the quality of Louisiana water. More information on this program can be found in Part III of this report.

Point Source Control Program

Introduction

Louisiana's water pollution control program is carried out primarily by LDEQ. LDEQ operates to preserve the integrity of Louisiana's waters through the use of various point source and NPS programs. All offices within LDEQ have some responsibility for implementing water pollution control programs. These offices include the Office of the Secretary (regulatory development and NPS program), the Office of Management and Finance (grants and contracts, information services, clean water state revolving fund), the Office of Environmental Services (OES) (municipal and industrial wastewater discharge permitting; water quality certification program; water quality standards, assessment and TMDL development), the Office of Environmental Compliance (OEC) (surveillance and enforcement of permit requirements and pollution control regulations, investigation of complaints and spills, water quality assessment, and review/recommendation of standards). An overview of LDEQ's organizational structure for all activities can be found at: http://www.deq.louisiana.gov/portal/tabid/2367/Default.aspx. The following sections address various facets and recent activities of the point source water pollution control program.

Clean Water State Revolving Fund Program

The Clean Water State Revolving Fund Program provides financial assistance for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level this authority is granted by, R.S. 30:2011(D)(4), and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature). This statute established a state revolving loan fund capitalized by federal grants (Capitalization Grants for Clean Water State Revolving Funds, Catalog of Federal Domestic Assistance (CFDA) 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2015, USEPA, through LDEQ, has awarded $439,832,923 in fund capitalization grants to Louisiana communities. With the required 20% state match of $82,468,202, less 4% for administration fees, there is a total of $504,707,808 that has been made available for loans to communities. In addition, a total of $532,084,103 of repaid "recycled" loan monies has been made available for loans.

As of June 2015, 211 loans to communities totaling $896,528,684 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 14 requests for loans totaling $146,024,135 have been received and are in the application process. For more information on the Clean Water State Revolving Fund refer to:
http://www.deq.louisiana.gov/CWSRF.

Water Discharge Permits

Water discharge permits are official authorizations developed and issued by the OES of LDEQ. The Louisiana Pollutant Discharge Elimination System (LPDES) permit establishes the effluent limitations and conditions for wastewaters discharged into waters of the state. The permitting process allows the state to control the amounts and types of wastewaters discharged into its surface waters. A permit is required for the discharge of pollutants from any point source discharge into waters of the state of Louisiana. In 1996, LDEQ assumed responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the USEPA. USEPA retained responsibility for the federal sewage sludge disposal program. However, the state also developed and implemented its own state sewage sludge disposal program. USEPA retained authority for offshore discharges past the three-mile territorial seas limit. More information on LDEQ's water discharge permits program can be found at:
http://www.deq.louisiana.gov/portal/tabid/63/Default.aspx.

From October 1, 2013 through September 30, 2015, the following permits were issued:

Table 2.2.2

Louisiana Pollutant Discharge Elimination System water discharge permits and modifications issued from October 2013 through September 2015.

State Permit	Number of Permits	Number of Permits (including modifications)
Minor Sanitary	160	163
Major Sanitary	42	47
Minor Industrial	221	243
Major Industrial	49	57
Major MS4[1]	1	1
Stormwater General	770	770
Non-Stormwater General[2]	1,062	1,145
Totals	**2,305**	**2,426**

[1] Major Municipal Separate Storm Sewer System Permits
[2] Does not include 3,981 permits re-authorized when master general permits were reissued

Inspection Division Compliance Assurance Inspections

Municipal, industrial, federal, and agricultural point source dischargers are monitored to verify compliance with permitted effluent limitations and compliance schedules. The information derived from this program can also be applied to the interpretation of state water quality data and can be used as input to water quality plan development.

The types of compliance inspections undertaken by the Inspection Division (ID) that are reported here include:

- Compliance Evaluation Inspections (CEI): Non-sampling inspections are designed to verify permittee compliance with applicable LPDES permit requirements and compliance schedules.
- Compliance Sampling Inspections (CSI): Samples of the influent and/or effluent are collected and analyzed to determine permit compliance, in addition to the inspection activities performed in the CEIs.

The following compliance inspection activities were conducted from October 2013 through September 2015:

Table 2.2.3

Louisiana Department of Environmental Quality, Office of Environmental Compliance, Inspection Division Water Quality Compliance Inspections performed October 2013 through September 2015.

Inspection Type	Number of Inspections
Compliance Evaluation Inspections	1,854
Compliance Sampling Inspections	27
Total WQ Compliance Inspections	**1,881**

Inspection Division Incident Investigations

The ID of the OEC received 14,308 Incident Notifications (Complaints or Release/Spills) across all media (air, water, hazardous waste, underground storage tanks, etc.) from October 2013 through September 2015. Each notification requires an investigation and an incident report. If action is deemed necessary following the initial investigation, the investigator refers the situation to the appropriate division for enforcement action, permit action, or remedial action. The division receives notifications that include reports of oil spills, sewage overflows, bypasses, water permit excursions, chemical spills, fish kills, unusual coloring in a stream, and illegal discharges. Environmental complaints are made to LDEQ's Single Point of Contact (SPOC). Notifications of emergencies and spill and release notifications are reported to the Louisiana State Police (LSP). LSP then notifies the LDEQ staff person on-call. More information on DEQ's Inspection Division can be found at: http://www.deq.louisiana.gov/portal/tabid/66/Default.aspx.

Table 2.2.4

Louisiana Department of Environmental Quality, Office of Environmental Compliance, Inspection Division incident investigations performed October 2013 through September 2015.

Notification Type	Number of Notifications
Complaint Notifications	6,221
Release/Spill Notifications	8,087
Total Notifications	**14,308**

Inspection Division Identification of Unpermitted Point Sources

The LDEQ Compliance Monitoring Strategy (LDEQ 2016) outlines approaches for monitoring permit compliance to aid in addressing potential point source issues. In 2015, the LDEQ Inspections Division conducted 1,082 water inspections within 220 subsegments in Louisiana.

Additionally, the LDEQ Inspections Division performs Watershed Based Inspection Projects under the Compliance Monitoring Strategy to identify nonpoint sources and unpermitted point source dischargers within targeted subsegments. In 2015, the LDEQ Inspections Division conducted Watershed Based Inspections in 16 subsegments (see Table 2.2.5). Also in 2015, the Watershed Based Inspection for Bayou Choctaw (subsegment number LA120103) in the Terrebonne Basin that began in 2014 was completed (LDEQ 2015a).

Table 2.2.5.

Louisiana Department of Environmental Quality, Office of Environmental Compliance, Inspection Division, Watershed Based Inspection Project results for 2015.

Subsegment Number	Waterbody Segment Description	Inspections	Notice of Deficiency (NOD)
LA010301_00	West Atchafalaya Basin Floodway - From Simmesport to Butte LaRose Bay and Henderson Lake	7	6
LA020601_00	Intracoastal Waterway - From Bayou Villars to Mississippi River	140	21
LA020802_00	Bayou Barataria and Barataria Waterway - From ICWW to Bayou Rigolettes	5	0
LA030201_00	Calcasieu River - From Marsh Bayou to saltwater barrier	33	32
LA030301_00	Calcasieu River and Ship Channel - From saltwater barrier to Moss Lake; includes Ship Channel, Coon Island Loop, Clooney Island Loop	4	4

Table 2.2.5.

Louisiana Department of Environmental Quality, Office of Environmental Compliance, Inspection Division, Watershed Based Inspection Project results for 2015.

Subsegment Number	Waterbody Segment Description	Inspections	Notice of Deficiency (NOD)
LA030801_00	West Fork Calcasieu River - From confluence with Beckwith Creek and Hickory Branch to mainstem of Calcasieu River	3	3
LA030805_00	Indian Bayou - From headwaters to West Fork Calcasieu River	9	9
LA040704_00	Chappepeela Creek - From LA-1062 to Tangipahoa River	3	2
LA041601_00	Intracoastal Waterway - From Inner Harbor Navigation Canal to Chef Menteur Pass	5	1
LA060211_00	West Atchafalaya Borrow Pit Canal - From Bayou Courtableau to Henderson; includes Bayou Portage	19	3
LA060301_00	Bayou Teche - From headwaters at Bayou Courtableau to Keystone Locks and Dam	8	4
LA060702_00	Lake Fausse Point and Dauterive Lake	1	0
LA060703_00	Bayou Du Portage	2	0
LA080603_00	Bayou D'Arbonne - From Lake Claiborne to Bayou D'Arbonne Lake	1	1
LA080401_00	Dugdemona River - From headwaters to Big Creek	9	9
LA081611_00	Bayou Funny Louis - From headwaters to Little River	1	1

Water Quality Certification

Water quality certification is an activity of the Municipal, Biosolids and Water Quality Section of LDEQ. Certification is required when, "Any applicant for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the state in which the discharge originates or will originate..." Such changes include land clearance for residential and commercial development, oil and gas activities, and municipal infrastructure projects. Section 401 of the CWA requires water quality certification for all §404 permits administered by the Corps of Engineers and certain federal licenses administered through FERC (Federal Energy Regulatory Commission). From October 1, 2013 through September 30, 2015, 437 water quality certifications were issued

by LDEQ. More information on LDEQ's water quality certification program can be found at: http://www.deq.louisiana.gov/portal/tabid/2268/Default.aspx.

Enforcement

The enforcement activities of the LDEQ Water Enforcement Section are designed to ensure that all possible infringements of water quality standards, rules, and regulations are handled in a rapid and consistent manner. To prevent pollution of the waters of the state and to ensure remediation in the event of pollution, the Water Enforcement Section coordinates its enforcement activities with other sections in LDEQ, especially the Water Permits Division in the OES and the ID of the OEC. Field investigations, file reviews, permit noncompliances, and reviews of discharge monitoring reports (DMRs) are all used to initiate enforcement actions. The Water Enforcement Section initiates all formal enforcement actions and follows the actions through all appropriate levels to ensure full compliance with state laws and regulations. LDEQ seeks to provide a clean, healthy environment through protection of the state's water resources by the reduction of pollution, education of the public, and consistent, open, and accountable application of standards, rules, and regulations. More information on LDEQ's Water Enforcement Section can be found at: http://www.deq.louisiana.gov/portal/tabid/67/Default.aspx. From October 2013 through September 2015, the following enforcement activities were recorded:

Table 2.2.6

Louisiana water quality environmental enforcement actions issued from October 2013 through September 2015.

Enforcement Actions	Number
Notice Of Corrected Violations	23
Compliance Orders (CO)[1]	291
Notice of Potential Penalty (NOPP)	31
Administrative Orders	16
Penalties	210
Settlement Agreements	39

[1]Includes CO and Consolidated CO/NOPP

Table 2.2.7

Louisiana water quality environmental penalties issued from October 2013 through September 2015.

Penalties	Dollar Value
Penalties Issued	$868,939
Penalties Paid	$331,005
Penalties Appealed	
Cash From Settlement Agreements	$1,358,240
Total Value of BEPs[1]	$427,000

[1]Beneficial Environmental Projects

Nonpoint Source Program

Section 319 of the Clean Water Act

Section 319 of the CWA required the governor of each state to develop a Nonpoint Source (NPS) Assessment Report and an NPS Management Plan to identify NPS pollutants and describe management strategies and a timeline for implementation http://water.epa.gov/polwaste/nps/index.cfm. In response to this federal law, the Louisiana Legislature passed Revised Statute 30:2011, signed by the governor in 1987 as Act 272. This law directed LDEQ, designated as lead agency for the NPS program, to develop and implement an NPS Management Program. The NPS Management Program was developed to facilitate coordination with appropriate state agencies including, but not limited to Louisiana Department of Natural Resources (LDNR), LDWF, Louisiana Department of Agriculture and Forestry (LDAF), and Louisiana State Soil and Water Conservation Commission (SWCC), in areas pertaining to their respective jurisdictions.

Nonpoint Source Management Program

Section 319(b) required states to prepare an NPS Management Plan, including these elements (all references to sections, subsections, paragraphs, and subparagraphs are from CWA §319):

- An identification of BMPs and measures which will be undertaken to reduce pollutant loadings resulting from each category, subcategory, or particular NPS designated under paragraph (1)(B), taking into account the impact of the practice on groundwater quality.
- An identification of programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of BMPs by categories, subcategories, and particular nonpoint sources designated under subsection (A).
- A schedule containing annual milestones for (a) utilization of program implementation methods identified in subparagraph (B); and (b) implementation of BMPs identified in subparagraph (A) by the categories, subcategories or particular nonpoint sources designated under paragraph (1)(B). Such schedule shall provide for utilization of the BMPs at the earliest practicable date.
- A certification of the attorney general of the state or states (or the chief attorney of any state water pollution control agency which has independent legal counsel) that the laws of the state or states, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program, and a schedule and commitment by the state or states to seek such additional authorities as expeditiously as practicable.
- Sources of federal and other assistance and funding (other than assistance provided under subsections (h) and (i)) which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.

- An identification of federal financial assistance programs and federal development projects for which the state will review individual assistance applications or development projects for their effect on water quality pursuant to procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the state's NPS pollution management program.

In 1993, USEPA approved Louisiana's NPS Assessment Report and Management Plan. In November 2012, USEPA-Region 6 approved Louisiana's revised NPS Management Plan. LDEQ recently updated the NPS Management Plan to include statewide and watershed implementation tasks to partially and/or fully restore NPS-impaired waters from 2011 to 2016. It can be viewed at http://nps.ldeq.org/docs/000002_NPS_Management_Plan_1.pdf.

Watershed Planning and Management

USEPA and LDEQ developed a watershed approach as a geographically-based, systematic process to reduce NPS pollution and improve water quality. Watershed planning can be an effective management strategy to protect healthy waters and/or restore impaired waters. Through watershed assessment, water quality data is analyzed; if the water body is impaired, a TMDL, strategic assessment plan (SAP), watershed implementation plan (WIP), or some alternative plan are developed and implemented. SAPs were developed by LDEQ to establish a foundation for proposed waterbody restoration projects to identify the level of need, establish current water quality conditions and target critical areas. SAPs are submitted to the USEPA-Region 6 and outline the initial steps of strategically assessing a waterbody to establish the baseline or current conditions of a waterbody and to locate critical areas, areas of high pollutant loading into the waterbody. SAPs are approved by the USEPA and if the data gathered through the SAP phase indicates an impairment the SAP evolves into a detailed WIP that is formalized and submitted to USEPA. SAPs differ from WIPs in that SAPs provide detail on the informational gathering phase to assess the waterbody and propose actions to be taken. A WIP adds to the SAP by providing greater detail and lays out the actual implementation plan to address the impairment and document any changes in water quality during the life of the project.

USEPA outlined a set of nine key elements for an acceptable WIP, and LDEQ utilizes this outline as a guide in partnering with stakeholders on protection and/or restoration of NPS waters. These nine key elements include:

- An identification of geographic extent of the watershed, measurable water quality goals, causes, and sources to be controlled to restore water quality
- A description of NPS management practices to achieve estimated load reductions
- A description of agencies and programs to implement NPS management practices
- An identification of sources and amounts of financial and technical assistance to implement NPS management practices
- An educational outreach component to implement the WIP
- A reasonably expeditious schedule for implementing the WIP

- A description of interim, measurable milestones for determining whether NPS management practices or other control actions are being implemented
- An adaptive implementation process that includes a set of criteria that can be used to determine (1) whether NPS load reductions are being achieved; (2) whether substantial progress is being made toward attaining or assuring continued attainment of water quality standards and, if not, the criteria for determining whether WIPs should be revised; and (3) where an NPS TMDL has been established, whether an NPS TMDL needs to be revised or a new TMDL developed
- A monitoring component to evaluate effectiveness of WIPs in restoring water quality and designated uses in NPS waters

Implementation

Louisiana Administrative Code (LAC 33:IX.1105. Definitions) defines NPS pollution as "a diffuse source of water pollution that does not discharge through a point source, but instead, flows freely across exposed natural or manmade surfaces such as agricultural or urban runoff and runoff from construction, mining, or silviculture activities that are not regulated as point sources."

NPS pollutants are typically undiscernible or unconfined discharges that enter a water body during rainfall events. Land-use activities identified as contributing to NPS pollution include agriculture, forestry, urban, home sewage treatment systems, construction, hydromodification, and resource extraction (sand and gravel mining). The type of NPS pollution associated with land-use activities includes sediment, nutrients, metals, organic material, and bacteria. Some of these pollution sources are managed through stormwater permits, and others are managed through NPS programs.

LDEQ's NPS Program focuses on improving water quality in impaired waters and protecting healthy waters from becoming impaired. The primary objective of the NPS Management Program is to implement BMPs as well as educational outreach programs to reduce NPS pollution. The watershed planning process relies on many partnerships and collaborative efforts to provide information on water quality conditions and land-use activities. As water quality improves, a water body can be removed from the state's §303(d) impaired list, and a success story can be published on USEPA's NPS website http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/nonpoint-source-success-stories. LDEQ initiated a statewide educational outreach program about NPS pollution called "Be the Solution." For more information about the LDEQ "Be the Solution" outreach program refer to: http://www.deq.louisiana.gov/portal/tabid/2953/Default.aspx. LDEQ has set a goal to partially or fully restore 40 water bodies from 2011 to 2016.

Through the NPS Program, watershed groups have partnered with LDEQ-NPS to assist in restoring watersheds on a local level. They identify and engage local stakeholders to get involved and contribute resources and assistance. The stakeholders assist in planning, water quality monitoring, education and outreach and BMP implementation.

An important partner in Louisiana's NPS Program is the LDAF; this agency implements the agricultural component of the program. LDAF currently applies directly to USEPA for the incremental portion of §319 funds and utilizes those funds for BMP implementation in watersheds where TMDLs and WIPs have been developed. LDEQ and LDAF prioritize impaired watersheds and exchange information on water quality data and land-use practices.

Two more important partners in Louisiana's NPS Program are the Source Water Protection Program (SWPP) and the ASSET Program. SWPP partners with local communities in Louisiana to protect drinking water supplies from existing and potential contamination from NPS pollution. One of SWPP's priorities has been reducing bacterial problems from home sewage treatment systems for many communities in Louisiana. Since bacterial problems cause water bodies to be listed on the §303(d) list, SWPP has focused its efforts on water bodies designated as drinking water supplies, such as Bayou Lafourche, Sibley Lake, and Big Creek. The ASSET Program is an ambient groundwater sampling and analysis program that monitors Louisiana's major freshwater aquifers. These aquifers, such as the Sparta, Chicot, and Southern Hills Aquifer System, are also sources of drinking water that could be contaminated by NPS pollution.

One of the remaining challenges in Louisiana is partnering with urban areas on their NPS pollution problems. Many cities are now required to manage pollutants through stormwater permits. Innovative technologies such as rain gardens, porous pavements, green roofs, and small wetland detentions, or swales, could be effective in retaining nutrients on site rather than discharging them to water bodies. LDEQ will continue to provide information to cities and rural communities on innovative solutions for reducing urban NPS pollutants.

Chapter 3: Cost/Benefit Assessment

Cost Information

A true cost/benefit assessment for the water quality management efforts of LDEQ is very difficult to obtain because research on the economic value of incremental improvements in water quality is not currently available. While recent economic research has begun to place monetary values on otherwise intangible environmental benefits such as wilderness for nonconsumptive recreation, such efforts have not taken place in the area of water quality. In lieu of a formal cost/benefit assessment of water quality improvements, LDEQ is providing information on pollution abatement capital expenditures and operating costs. To place these expenditures in perspective, financial information on activities that benefit from this investment is also provided.

Much of LDEQ's water quality-related budget is self-generated through permit fees and enforcement actions; however, a portion is derived through federal grants. The grants include the CWA §319 grant for NPS management activities, the §604 grant for state water quality management planning activities, and the §106 grant for water pollution control activities. Money from each of the grants programs is divided throughout the water quality-related program areas and provides funding for personnel, equipment, survey work, TMDL development, water quality management planning, monitoring, assessment, surveillance, and enforcement. See Table 2.3.1 for an illustration of LDEQ's approximate yearly costs to implement the CWA. Described below are a few of the programs and activities supported by each of these federal grants and state funds.

Under the §319 grant for NPS management issues, LDEQ continues to work with a number of partners on projects targeting NPS pollutants from urban runoff, forestry, agriculture, sand and gravel operations, and home sewage treatment systems. Other agency and funding programs that are also aimed at improving water quality through implementation of BMPs and cost incentives include Environmental Quality Incentive Program (EQIP), Wildlife Habitat Incentive Program (WHIP), and the Wetland Reserve Program (WRP). During FY2012 and FY2013, the U.S. Department of Agriculture (USDA) obligated $42,128,318 in federal funds through the EQIP/National Resources Conservation Service program to implement agricultural BMPs on 347,827 acres of land in order to reduce the amount of NPS pollutants entering water bodies in the state. During this same time period, an additional $1,268,058 in federal funds was utilized to implement the WHIP on 5,035.5 acres of private lands. During FY2012 and FY2013, the WRP enrolled 37,820.7 acres of land in wetland protection programs totaling $70,561,351 in federal funds. These programs, along with LDEQ's NPS Program, are intended to reduce water quality impacts from agricultural production in Louisiana. In Part II, Chapter 2, the Nonpoint Source Program section has more information on this topic as well as other efforts by the NPS Program at LDEQ. For more information on LDEQ's NPS Program refer to: http://nonpoint.deq.louisiana.gov/.

Section 604 grant monies are used to support the development and revisions of TMDLs. Section 303(d) of the CWA requires the identification and listing of impaired waters and prioritization of the impaired waters for TMDL development. For more information on LDEQ's TMDL program refer to: http://www.deq.louisiana.gov/portal/tabid/130/Default.aspx.

Table 2.3.1.

Approximate yearly costs (FY2015) to implement the Clean Water Act by the Louisiana Department of Environmental Quality and its contractors, October 1, 2014 – September 30, 2015.

Description	Amount
Federal Funds	
CWA Section 106	$3,691,892
CWA Section 106 supplemental (estimate)	$206,329
CWA Section 604(b)	$91,592
CWA Section 319	$1,739,844
FY14 Exchange Network Grant	$11,258
Clean Water State Revolving Loan Fund (Administrative Costs)	$4,052,322
Total Federal Funds	**$9,793,237**
State Funds	
Environmental Trust Fund and Other Fees	$10,890,094
General Fund	$0
Total State Funds	**$10,890,094**
Grand Total	**$20,683,331**

The §106 grant provides funding support for the entire water pollution control/water quality management program. Activities supported by the §106 grant include ambient water quality monitoring, assessment of ambient water quality data, development of the Water Quality Inventory (now known as the IR), revision of Louisiana's Water Quality Management Plan, development and revision of surface water quality standards, development and issuance of wastewater discharge permits, compliance inspections, complaint investigations, and development of enforcement actions. §106 grant funding for FY 2015 was approximately $4,986,090.

The Clean Water State Revolving Fund Program provides financial assistance to communities for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State

Water Pollution Control Revolving Funds. On the state level, R.S. 30:2011(D)(4) and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature) were enacted. These statutes established a state revolving loan fund capitalized by federal grants (Capitalization Grants for Clean Water State Revolving Funds, CFDA 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2015, USEPA, through LDEQ, has awarded $439,832,923 in fund capitalization grants to Louisiana communities. With the required 20% state match of $82,468,202, less 4% for administration fees, there is a total of $504,707,808 that has been made available for loans to communities. In addition, a total of $532,084,103 of repaid "recycled" loan monies has been made available for loans. Also as of June 2015, 211 loans to communities totaling $896,528,684 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 14 requests for loans totaling $146,024,135 have been received and are in the application process. For more information on the Clean Water State Revolving Fund refer to: http://www.deq.louisiana.gov/CWSRF.

Data on pollution abatement capital expenditures and operating costs from the U.S. Census Bureau publication *Pollution Abatement Costs and Expenditures: 2005* has been included to provide estimates of costs to industry related to water quality protection and improvement. For 2005, the most recent year for which data is available, industry in Louisiana spent $89.2 million in capital expenditures to protect water quality, with the petroleum industry ($61.2 million), chemical industry ($25.3 million), and paper industry ($0.8 million) leading in dollars spent. For the same period, water quality-related pollution abatement operating costs for Louisiana industry totaled $530.4 million with spending led by the chemical sector ($301 million), petroleum industry ($173.1 million), and paper industry ($40.6 million). This represents a $619.6 million outlay for water pollution control-related expenses (U.S. Census Bureau 2008).

In an attempt to place state and industry expenditures in perspective and to provide an approximation of a cost/benefit assessment, information is provided below on the size of Louisiana's water resource base and its direct and indirect economic benefits to the state.

Benefits Information

Louisiana's water resources occupy 9,174 square miles of the total state surface area of 43,204 square miles.[1] LDEQ is thus directly or indirectly responsible for protecting the water quality of approximately 17.5% of the total surface area of the state. In many instances, protection of surface waters also involves the management of stormwater runoff from land-based activities such as farming, aquaculture, forestry, and suburban/urban areas. This greatly increases the

[1] https://www.census.gov/geo/reference/state-area.html:

effective water quality protection area for which LDEQ is either directly or indirectly responsible.

Many Louisiana citizens depend on good water quality, not only for drinking water sources and consumptive/nonconsumptive recreation, but also for commercial purposes, and these activities produce revenue for the state through license sales. *The LDWF 2013-2014 Annual Report* (LDWF 2014) states that the agency issued 65,252 commercial fishing licenses, generating in excess of $3.8 million in revenue from license sales. Boat registration/title transactions for 2013-2014 numbered 188,000; bringing in over $4 million in revenue. Over 233,000 commercial fishing trips were reported, producing more than 155 million pounds of seafood. The total 2013 economic effect of the commercial fisheries industry in Louisiana was $2.1 billion (National Oceanic and Atmospheric Administration (NOAA) 2013).

LDWF also reports that the shrimp fishery is Louisiana's most valuable commercial fishery. Louisiana continued to lead the nation in shrimp landings with approximately 98 million pounds landed in 2013. The dockside value was about $178 million. Additionally, Louisiana blue crab landings for 2013 totaled 38.8 million pounds, bringing in $51 million dockside.

Louisiana regularly leads the U.S. in oyster production, averaging approximately 1/3 of the nation's oyster landings. Oysters routinely have a total annual economic impact on the Louisiana economy of roughly $300 million. In 2013, Louisiana provided over 11 million pounds of oysters, with a dockside value of more than $45 million (NOAA 2013). Louisiana consistently ranks #1 in landings among Gulf of Mexico states, bringing in over 50% of all oysters landed (LDWF 2012).

Louisiana's commercial crawfishing industry also depends on good water quality. The Louisiana State University (LSU) Agricultural Center estimates commercial harvest figures of $172 million for aquaculture crawfish and $14.3 million in wild-caught crawfish for 2014. Gross value of Louisiana aquaculture for 2014 was $293.8 million, reported by the LSU AgCenter. Fur animal and alligator harvesting also added $11 million to the 2014 total (LSU AgCenter 2014).

Recreational fishing made an important contribution to Louisiana's economy with a total 2013 economic impact of approximately $2.9 billion (NOAA 2013). In 2013-2014, anglers took over 5 million marine recreational fishing trips (LDWF 2014). A survey presented in the *2009-2013 Louisiana Statewide Comprehensive Outdoor Recreation Plan* revealed that "Fishing/Crabbing" was #1 out of the Top 10 2008 Important Outdoor Recreational Activities Among Households, and "Public Access to State Waters" was #4 (Louisiana Office of State Parks (LOSP) 2009).

Both recreational and commercial fishing have an obvious relationship to Louisiana's water resources. Not so obvious is the connection between high quality water resources and hunting/nonconsumptive wildlife activities. Hunting is popular in Louisiana, and it is widely acknowledged that terrestrial wildlife and especially waterfowl are dependent on the availability of high quality waters. A total of 191,300 deer hunters participated in hunting activities during the 2013-2014 deer season. There were also 77,600 duck hunters, 38,300 dove hunters, 1,100 quail hunters, 3,700 woodcock hunters, and 21,300 turkey hunters (LDWF 2014).

The total retail sales figure associated with hunting in Louisiana in 2011 was $564 million (USFWS 2013). In 2011, an estimated 1,010,000 participants engaged in wildlife watching (nonconsumptive recreation), resulting in a total economic effect of $542.7 million to the state (USFWS 2013).

In 2006, the most recent year for which these figures are available, fishing, hunting, and wildlife activities generated an estimated $4.61 billion in retail sales, $6.75 billion in total economic effect, $446.2 million in state and local tax revenues, and supported 76,700 jobs after adjusting for multiple counting of boat purchases (Southwick and Assoc. 2008). In fiscal year 2013/2014, LDWF sold more than 2.5 million recreational hunting, fishing, trapping, and nonconsumptive use licenses to more than 800,000 customers, generating in excess of $20 million in revenue (LDWF 2014).

The wildlife, fishing, and boating resources of Louisiana generate substantial economic benefits to state residents and to the common good. Industry investment in water pollution abatement capital expenditures and operating costs protects a multibillion-dollar industry. This financial outlay typically amounts to less than 10% of the value of the annual benefits. Moreover, hunters and nonconsumptive users alike are less likely to participate in their preferred activities in areas of questionable water and aesthetic quality. An all-encompassing approach to environmental and resource management requires that consideration be given to all wildlife, aquatic and terrestrial, because all require clean water for their survival. While the total contribution of fishing, hunting, and nonconsumptive recreation cannot be directly related to water resources, almost all of it can be associated with the need for clean water. In a 2005 survey of 403 Louisiana citizens by the Southeastern Association of Fish and Wildlife Agencies (SEAFWA), "Polluted water/water quality" was named the second most important fish and wildlife issue, led only by "Habitat loss" (SEAFWA 2005).

Clean water is also important to the tourism industry. Travel statistics indicate that 17% of resident visitors participate in some sort of outdoor activity during their visit, as do 6% of international visitors. The number of visitors statewide continues to exceed 2004 levels (pre-Hurricane Katrina), with 26.3 million people visiting the state in 2012 (Louisiana Office of Tourism (LOT) 2013). According to *The 2011 Louisiana Tourism Satellite Account (LTSA): An Update* (Terrell and Bilbo 2013), in 2011, tourists in Louisiana spent $10 billion, surpassing pre-Hurricane Katrina levels. Travel and tourism now account for 8.2% of state government revenues (Terrell and Bilbo 2013). Approximately 8% of the state workforce (147,000-plus people) work directly in the Louisiana travel industry; the LTSA report also states that 56,034 additional Louisiana jobs were created as an indirect effect of travel and tourism expenditures.

In FY 2014-15, approximately 1,898,618 visitors came to Louisiana State Parks and Historic sites (Louisiana Department of Culture Recreation and Tourism (LDCRT) 2016). State recreational areas cover over 1,510,298 acres. Out-of-state visitors to state parks spend almost $12 million in Louisiana annually. The Louisiana DCRT estimates that visitor spending at state parks returns $3.23 in state taxes for every dollar spent on park operation and maintenance (University of New Orleans (UNO), LSU, McNeese State University (MSU), Louisiana State University Shreveport (LSUS) 2006). In the LOSP *Strategic Plan for FY 14-15—18-19*, program objectives include sustaining the number of visitors served by the park system at an annual minimum of 2,200,000 by the end of FY 2018-2019, and sustaining a level of 175,000 individuals annually participating in interpretive programs and events by the end of fiscal year

2018-2019. LOSP has three strategies directly dependent on water quality to meet these objectives (LDCRT 2013):

- Strategy 2.1 – Maintain and operate all state park sites and facilities according to the highest national and international standards of quality
- Strategy 2.8 – Introduce new initiatives such as…the American Wetlands Program and participation in other tourism programs in order to further enhance visitation
- Strategy 2.17 – Increase the focus on native resources

For summaries of recent improvements to state parks, many involving waterfront and wetland sites, see the *2016 Sunset Report* (LDCRT 2016, 37-51).

There are also 23 National Wildlife Refuges in the state, all-encompassing some portion of Louisiana waterways. People use the U.S. Forest Service (USFS) refuges for hunting, fishing, birding, photography, and environmental education while spending money in localities near these sites. For more information on the USFS refer to: http://www.fws.gov/refuges/refugeLocatorMaps/Louisiana.html.

As one of the top five production destinations in the world, Louisiana is also seeing increasing economic benefit from the entertainment industry. According to an economic impact study commissioned by the Office of Entertainment Industry Development, Louisiana Department of Economic Development, more than $1.05 billion in sales were generated in Louisiana in 2014 from film and TV industry projects, and some of these productions utilized natural settings.[2] In 2013, 18 of the 108 major studio movies released in the U.S. had a significant number of their scenes shot in Louisiana. The Best Picture Oscar winner of 2013, *12 Years a Slave*, was filmed throughout rural south Louisiana. According to the LOSP (S. Broussard, pers. comm.), nine movies, seven documentaries, three TV shows, one TV movie, one TV pilot, and two music videos were filmed at State Parks sites in 2012-13, creating further national and international interest in Louisiana and its beautiful natural environment.

Although not all of Louisiana's outdoor recreational and scenic opportunities are water-based, water quality is an important consideration in the overall environmental perception of travelers. Because water quality often plays an important part in this recreation, it is imperative that it be enhanced and protected. Along with other quality-of-life parameters, environmental perception is a factor when Louisiana is contemplated as a place to relocate or start a business.

Louisiana invests a great deal of money in its efforts to enhance and maintain its water quality. In return, the citizens of Louisiana and visitors derive a number of benefits, both financial and aesthetic, from the state's abundance of water bodies. With the combined efforts of LDEQ, federal and state agencies, industry, and the citizens of Louisiana, our waters will continue to provide abundant recreational and commercial benefits for everyone.

[2] http://www.louisianaentertainment.gov/docs/default-source/default-library/2015_oeid_program_impact_report_final.pdf?sfvrsn=2

PART III: SURFACE WATER MONITORING AND ASSESSMENT

Chapter 1: Surface Water Monitoring Program

The surface water monitoring programs of the OEC of LDEQ are designed to provide data for the following objectives:

- Measure progress toward achieving water quality goals at state and national levels
- Establish and review the state water quality standards
- Determine the assimilative capacity of the waters of the state
- Establish permit limits for wastewater discharges

The surface water monitoring program is composed of an Ambient Water Quality Monitoring Network (AWQMN), intensive surveys, special studies, and wastewater discharge compliance sampling. Some components of the state water monitoring program are briefly described below.

Ambient Water Quality Monitoring Network

The primary use of the data from the AWQMN is to determine if water quality standards are being attained. To accomplish this, core indicators are monitored and used to determine designated use support (Table 3.1.1). Data may also be used for/by other programs within LDEQ (e.g., standards/criteria determination, modeling, permitting, project planning) and external entities.

Data is collected systematically to obtain water quality monitoring data on selected water subsegments defined in the Surface Water Quality Standards (LAC 33:IX Chapter 11). The current approach to ambient surface water monitoring consists of a four-year rotating sampling plan with approximately one-fourth of the selected subsegments in the state sampled each year. Long-term monitoring sites are located in 10 of the 12 basins and will be sampled every year throughout the four-year cycle. Under this plan LDEQ conducts a complete census of selected subsegments identified in LAC 33:IX.1123, Table 3 during the four-year rotation. There are, however, some subsegments that are difficult to sample within the physical and time constraints imposed upon the regional staff. These difficult-to-monitor subsegments will be evaluated individually to determine what type of monitoring and assessment can best be performed to assess the water quality of that subsegment.

Beginning with the 2009-2010 AWQMN sample site rotation, the number of sites being sampled was reduced due to state budget constraints. As budget restrictions eased, LDEQ resumed AQWMN sampling at the level described in this report and the ambient monitoring quality assurance project plan (QAPP).

ID personnel conduct the ambient network sampling. At each sampling site, the sample collector takes *in situ* field measurements and collects water samples for laboratory analysis for the parameters outlined in Table 3.1.1.

Table 3.1.1

Designated uses for Louisiana water bodies and the core indicators used to determine water quality standards attainment

Designated Use	Core Indicators	Basis for Use Support Decision
Fish and Wildlife Propagation	Dissolved Oxygen (mg/L) (Routine grab ambient)	Percent exceedance[1]
	Dissolved Oxygen (mg/L) (Continuous Monitoring)	Percent exceedance[1]
	Temperature	Percent exceedance
	pH	Percent exceedance
	Chloride	Percent exceedance
	Sulfate	Percent exceedance
	Total Dissolved Solids	Percent exceedance
	Turbidity	Percent exceedance
	Toxic Substances	Less than two exceedances in three years[2]
	Metals	Less than two exceedances in three years[2]
Limited Fish and Wildlife Use	Dissolved Oxygen	Percent exceedance[1]
	Dissolved Oxygen (mg/L) (Continuous Monitoring)	Percent exceedance[1]
Primary Contact Recreation	Fecal Coliform	Percent exceedance
	Temperature	Percent exceedance
	Toxic Substances	Less than two exceedances in three years[2]
Secondary Contact Recreation	Fecal Coliform	Percent exceedance
	Toxic Substances	Less than two exceedances in three years[2]
Drinking Water Supply	Color	Percent exceedance
	Fecal Coliform	Percent exceedance
	Toxic Substances	Less than two exceedances in three years[2]
	Metals	Less than two exceedances in three years[2]
Outstanding Natural Resource Waters	Turbidity	Percent exceedance
Agriculture	None (indicated by support of other designated uses)	
Oyster Propagation	Fecal Coliform	Percent exceedance

1. LDEQ's AWQMN Dissolved Oxygen (DO) routine grab samples are used as an initial screening for DO criteria assessments. In the event the criterion is not met, continuous monitoring for DO may be initiated.
2. LDEQ has adopted a screening approach for water quality assessment decisions based on metals and toxics (also referred to in this document as organic compounds) data.

The Water Quality Program management decisions are made from conclusions that are based on data. Therefore, it is imperative that water quality data be diligently managed in a structured database. Water quality monitoring data managed by the Water Permits Division (WPD) is stored in a set of related Oracle tables and referred to as the Louisiana Environmental

Assessment Utility (LEAU) database. Data management is accomplished through a variety of tools including Microsoft Access append and import queries, Microsoft Excel worksheets, and direct entry into Oracle tables through a Microsoft Access front end.

Data are collected or received for a variety of water quality monitoring projects including, but not limited to: 1) Ambient Water Quality Monitoring Network, 2) Mercury Contaminant Study, 3) Clean Metals sampling, 4) Calcasieu Toxics Study, 5) Nutrient Gradient Project, 6) TMDL studies, and 7) Ecoregion project. Data management procedures will be followed for most water quality projects; should alternate data management procedures be required for a special project, those procedures may be outlined in a QAPP, an additional Standard Operating Procedure (SOP), or included in the next revision of the Data Management SOP as appropriate. Data submittals from some water quality monitoring projects, such as the Calcasieu Toxics Study, are no longer uploaded by the WPD, Water Quality Unit (WQU).

In situ water quality field data are recorded at the time of sample collection on the LDEQ Surface Water Quality Field Measurements (SWQFM) form or the Ambient Water Quality Site Information Sheet (AWQSIS). In addition to meter results, field data include date, collection time, sampling location, and collector's name. The Inspection Division and Water Surveys Section staffs are responsible for submitting field data to the Louisiana Environmental Analytical Data Management System (LEADMS) and field records to LDEQ's Electronic Data Management System (EDMS). The WPD, WQU is responsible for transferring field data from LEADMS to the LEAU database.

Laboratories are required to produce analytical data narrative reports in PDF format and EDDs in the LEADMS format. The deliverables include analytes, sample date, methods of analysis, date of analyses, chemists performing the analyses, reporting limits, quality control information, and the results associated with the sample. EDDs and PDF reports are transmitted to LDEQ's Laboratory Contract Management Section (LCMS) by contract laboratories for initial quality control review and then forwarded to WPD, WQU in the form of emails. The WQU uploads the new data to LEAU after which WQU, Data Evaluation, Assessment and Reporting (DEAR) unit reviews the laboratory deliverables for quality assurance and either requests additional information from the laboratories or forwards the laboratory deliverables to WQU data management personnel for final data management in LEAU.

Data from the Ambient Water Quality Monitoring Network is sent to USEPA's Water Quality Exchange (WQX) annually for the period that was sampled two years prior to the submittal. It is extracted from LEAU and formatted, then uploaded to WQX through an Access program. Preparations are being made for this process to be submitted through the WQX node and the procedures will change when this is implemented.

Mercury Monitoring Program / Fish Tissue Monitoring Activities

In July 2015 LDEQ began planning for a restart of its former mercury monitoring program for fish tissue. Funding is provided through a Beneficial Environmental Project (BEP) with a major electrical utility company. Sampling began on February 11, 2016 on Bayou Queue de Tortue in southwest Louisiana and will be conducted once each year at approximately 45-50 sites beginning with those water bodies and sites where fish consumption advisories are currently in place. An additional three-four sites may be added each year as time and funding are available. These additional sites will be on water bodies where previous sampling indicated elevated levels

of mercury but concentrations were not sufficiently high to warrant an advisory. The project is scheduled to run through approximtely December 2019.

Samples are composites of three to nine individual fish or in some cases a single large fish. Freshwater target species include largemouth bass (*Micropterus salmoides*), bowfin (*Amia calva*), flathead catfish (*Pylodictis olivaris*), freshwater drum (*Aplodinotus grunniens*), blue catfish (*Ictalurus furcatus*) , channel catfish (*I. punctatus*) and crappie (*Pomoxis sp.*). Other appropriate species include spotted bass (*Lepomis punctatus*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*), buffalo (*Ictiobus sp.*), redear sunfish (*L. microlophus*), bluegill (*L. macrochirus*), and warmouth (*L. gulosus*). Saltwater targeted species are spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), red snapper (*Lutjanus campechanus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), and other appropriate species when available.

Fish tissue analysis will be done by the University of Louisiana Monroe, Environmental Analysis Laboratory. All sample results will be forward to the LDHH, Section of Environmental Epidemiology and Toxicology for risk assessment. LDHH scientists will determine the need for new, revised, or rescinded advisories and advise both LDEQ and the LDWF. Once the agencies concur with the LDHH recommendations, new or revised advisories will be announced by press release and posted on the LDHH and LDEQ websites.

More information on Louisiana's mercury monitoring program can be found at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=287. More information on Louisiana's fish tissue and advisory program can be found at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1631.

Intensive Surveys and TMDL Studies

LDEQ plans to revise existing TMDLs for water bodies in systematically prioritized watersheds. Priority will be given to those water bodies that were listed as impaired in the most recently approved Integrated Report and included in Louisiana's priorities under the new CWA Section 303(d) and TMDL Vision. In particular, this includes water bodies with existing TMDLs in which regulated point source discharges have been identified as the primary sources contributing to the impairment and there is a need for revision due to changes in criteria, loading, or other needed updates. Work will include the ongoing process of identifying water bodies meeting the noted criteria for revisions.

Surveys and laboratory analysis were previously conducted for the original TMDLs and should suffice for the revisions. However, additional survey work and data analysis may be required in some cases. These will be determined on a case-by-case basis. For each TMDL revision, work may include an evaluation and update of point source and nonpoint source loads in the watershed, updates to modeling and calculations based on new data, updates to the TMDL, and updates to the report. Critical stream conditions for flow, temperature, and dissolved oxygen may be updated based on new data.

The revisions are expected to be chosen from the following list of TMDL reports.

- TMDLs for Dissolved Oxygen and Nutrients for Bayou Lafourche Subsegment 020401 in the Barataria Basin, Louisiana;

- Bayou Segnette TMDL for Biochemical Oxygen-Demanding Substances Subsegment 020701;
- Bayou Des Allemands TMDLs for Dissolved Oxygen and Nutrients, Subsegment 020201;
- Bayou Des Allemands Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment 020301;
- TMDLs for Dissolved Oxygen and Nutrients in Selected Subsegments in the Middle Terrebonne Basin, Louisiana (120202, 120204, 120304, 120403, 120604);
- Bayou Manchac Watershed TMDL for Biochemical Oxygen-Demanding Substances-Phase I, Subsegment 040201;
- Lower Amite River Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegment 040303;
- Grays Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment 040304;
- Colyell Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegment 040305;
- TMDL for Dissolved Oxygen for Ponchatoula Creek and Ponchatoula River (Subsegment 040505) in the Lake Pontchartrain Basin, Louisiana;
- Selsers Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment 040603;
- Lower Tchefuncte River Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments 040802 and 040803;
- Bayou Lacombe Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments 040901 and 040902;
- Bayou Cane Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments 040903 and 040904;
- Bayou Liberty and Bayou Bonfouca Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments 040905, 040906, 040907, and 040908;
- TMDL For Dissolved Oxygen for Bayou Labranche (Subsegment 041201) in the Lake Pontchartrain Basin, Louisiana;
- TMDL for Dissolved Oxygen for New Orleans East Leveed Water Bodies (Subsegment 041401) in Lake Pontchartrain Basin, Louisiana; Or the TMDL for Dissolved oxygen for Violet Canal (Subsegment 041805) in the Lake Pontchartrain Basin, Louisiana.

Special Studies

Coastal Gulf Depth Profile Dissolved Oxygen Study

Louisiana's coastal Gulf of Mexico depth profile dissolved oxygen study was conducted from December 2014 through November 2015. While a detailed report for this study has yet to be completed, results from the study were used to assess three coastal Louisiana subsegments. Results of these assessments and a preliminary discussion of the data can be found in Part III, Chapter 2.

Coastal Dissolved Oxygen Criteria Study

Proper levels of oxygen in our water bodies are necessary for the respiration of aquatic life. Although a primary constituent of water, the oxygen contained in a water molecule is unavailable to biota due to chemical bonding; it must be present in its dissolved atmospheric form (O_2) to be of use. The amount of DO that is needed can vary among organisms, their associated habitats, ecosystems, and regions. The concentration of DO present in a waterway depends on atmospheric and photosynthetic inputs, metabolism of aquatic biota, physical processes, and environmental variables.

The LDEQ sets DO criteria to insure protection of aquatic biota at all life stages via the Fish and Wildlife Propagation Use designation in accordance with Section 303(c) of the Clean Water Act. State wide criteria for DO in Louisiana were established in 1972 via a memo from the USEPA, and were augmented with the publication of "*The Gold Book*" in 1986 (USEPA 1972; USEPA 1986). The criteria consist of minimum values of 5 mg/L for fresh and coastal marine waters and 4 mg/L for estuaries (LAC 33:IX.1113.C.3). At the onset, Louisiana voiced that many of its waterways had natural deviations from the recommended national criteria, and has continuously revised and promulgated new DO criteria though extensive processes— the most recent of which is outlined in this report (link here). The majority of marine and estuarine waters are, however, still defined by water quality criteria recommendations from over 40 years ago.

In an effort to update and refine DO criteria to reflect conditions present in Louisiana coastal waters, the LDEQ is evaluating USEPA and other state/regional approaches. New scientific methods and information, history of impairments, water quality data from various sources, and physical and environmental dynamics that may limit oxygen availability are being examined to insure that appropriate criteria are set by LDEQ for the protection of designated uses and impairment decisions. Estuarine and marine waters will be addressed together as coastal waters. Major study components include the following:

- Determining an approach for the development of revised coastal DO criteria: (1) laboratory generated concentration limits based on the acute, chronic, and recruitment sensitivity of select organisms to dissolved oxygen concentrations and (2) the use of natural conditions in un-impacted or least impacted locations to set appropriate criteria. Both of these procedures have been assessed, and the use of laboratory defined concentrations has been determined to be most suitable for state coastal waters, primarily due to limited availability of least impacted conditions (primarily in the Mississippi and Atchafalaya river basins) and available resources. Preliminary analyses and endpoints have been completed for coastal waters (non-stratified), with the inclusion of up-to-date data from scientific literature.
- Historic DO impairments of Louisiana's coastal waters have been reviewed for the past 14 years in relation to salinity regimes, TMDLs, and suspected natural conditions. The presence of these impairments in relation to potential revised criteria (non-stratified waters), the impact of promulgation of new criteria, and the effect on anti-degradation policy are under consideration.
- The revision of criteria for waters susceptible to low oxygen concentrations, i.e., stratified waters, is a major element of the study that is ongoing. An integrated approach, utilizing focal species, life history parameters, USEPA methodology, and laboratory and field DO sensitivity values is under development. A potential

ecological component for criteria end points is being evaluated in parallel. Additionally, data for coastal waters is being compiled and analyzed in relation to the physical and environmental parameters that promote stratification.

Nitrate Sensor Pilot Project

The nitrate sensor pilot project is studying the use of an *in situ* real-time monitor to measure nitrate. Nutrient monitoring using *in situ* real-time equipment will allow LDEQ to collect real-time data and will allow for continuous monitoring as well as providing the ability to track potential nutrient sources. During the project, data is being collected in conjunction with the AWQMN monthly water quality sampling, which includes analytical grab sampling for nutrients. Sampling began in July 2015 and continued to September 2015 in the Lake Pontchartrain basin. Sampling in the Ouachita River basin is scheduled to occur from October 2015 to March 2016 and in the Atchafalaya River, Mermentau River, and Vermilion-Teche River basins from April to September 2016.

Nutrient Trends at Long-Term Stations

Trends for total phosphorus (TP), nitrite + nitrate (NO_x), and total Kjeldahl nitrogen (TKN) concentrations were analyzed for the 21 long-term monitoring sites in LDEQ's AWQMN from 1978 to 2014. These sites represent eleven of the twelve watershed basins in Louisiana. A Mann-Kendall trend test found the majority of trends (73%) to be decreasing. All sites had a decreasing trend for TKN, twelve sites (57%) showed a decreasing trend for NO_x, and thirteen sites (62%) showed a decreasing trend for TP. Only one trend, NO_x for the Bogue Chitto River, was found to be increasing. Overall site medians ranged from 0.45 to 1.11 mg N-TKN/L, 0.05 to 1.34 mg N-NO_x/L, and 0.07 to 0.38 mg TP/L. The Mississippi River Basin has the highest values for NO_x, while the Vermilion River, Mermentau River, and Bayou Teche the highest values for TP and TKN. See Table 3.1.2 for a full listing of the nutrient concentrations and trends for each site. The land use of the river watersheds included in the trend analysis was calculated and then analyzed along with the median nutrient value in a Kendall tau correlation analysis. Agriculture was found to be significantly correlated with higher concentrations of TP and TKN ($p<0.01$), while forested lands were found to be significantly correlated with lower concentrations of TP and TKN ($p<0.05$). Even though agriculture was found to be associated with higher nutrient concentrations, basins with the most agriculture also showed the most improvement in nutrient management as evidenced by decreasing or no observable increasing trends in nutrients.

Table 3.1.2.

The minimum, median, and maximum total Kjeldahl nitrogen, nitrite + nitrate nitrogen, and total phosphorus concentrations and the Mann-Kendall trend results for all long-term monitoring stations. Decreasing trends (↓) are highlighted in blue, increasing (↑) in red, and insignificant (−) in gray. BDL equals below detection limit. Detection limits are 0.5 mg-N L^{-1} for total Kjeldahl nitrogen, 0.1 mg-N L^{-1} for nitrite+nitrate nitrogen, and 0.1 mg-P L^{-1} for total phosphorus.

Site	Total Kjeldahl Nitrogen				Nitrite + Nitrate				Total Phosphorus			
	Min	Median	Max	Trend	Min	Median	Max	Trend	Min	Median	Max	Trend
All sites	**BDL**	**0.73**	**3.00**		**BDL**	**0.22**	**3.00**		**BDL**	**0.13**	**1.00**	
Atchafalaya River	BDL	0.68	1.88	↓	BDL	0.85	2.38	↓	BDL	0.17	0.64	↓
Bayou Lafourche	BDL	0.54	2.42	↓	BDL	0.98	2.54	−	BDL	0.14	0.88	↓
Bayou Teche	BDL	1.05	2.84	↓	BDL	0.28	2.38	−	BDL	0.30	0.90	↓
Bogue Chitto River	BDL	BDL	3.00	↓	BDL	0.27	1.84	↑	BDL	BDL	0.62	−
Calcasieu River—Burton Landing	BDL	0.84	2.82	↓	BDL	0.13	0.74	↓	BDL	0.11	0.82	↓
Calcasieu River—Moss Bluff	BDL	0.70	2.72	↓	BDL	BDL	1.13	↓	BDL	BDL	0.61	−
Lake Pontchartrain	BDL	BDL	1.72	↓	BDL	BDL	1.30	−	BDL	BDL	0.73	−
Mermentau River	BDL	1.10	2.99	↓	BDL	0.17	1.13	↓	BDL	0.24	0.97	↓
Mississippi River—Belle Chasse	BDL	0.68	2.75	↓	BDL	1.35	2.98	−	BDL	0.20	0.88	↓
Mississippi River—Plaquemine	BDL	0.77	2.90	↓	0.13	1.31	3.00	−	BDL	0.19	0.94	↓
Mississippi River—St. Francisville	BDL	0.76	2.73	↓	BDL	1.30	2.94	−	BDL	0.20	0.80	↓
Ouachita River—Harrisonburg	BDL	0.72	2.71	↓	BDL	0.15	2.10	↓	BDL	0.13	0.54	−
Ouachita River—Sterlington	BDL	0.68	2.60	↓	BDL	0.12	2.35	↓	BDL	BDL	0.76	−
Pearl River	BDL	0.64	2.68	↓	BDL	0.15	1.80	−	BDL	BDL	0.38	−
Red River—Marksville	BDL	0.80	2.91	↓	BDL	0.16	0.90	↓	BDL	0.14	0.95	↓
Red River—Shreveport	BDL	0.83	2.33	↓	BDL	BDL	1.12	↓	BDL	0.13	0.80	↓
Tangipahoa River	BDL	BDL	2.08	↓	BDL	0.28	0.82	↓	BDL	BDL	0.72	↓
Tchefuncte River	BDL	0.69	2.60	↓	BDL	0.12	0.65	−	BDL	BDL	0.80	−
Tensas River	BDL	0.95	2.54	↓	BDL	0.26	2.70	↓	BDL	0.26	0.89	−
Tickfaw River	BDL	0.52	1.73	↓	BDL	0.21	0.82	↓	BDL	BDL	0.78	↓
Vermilion River	BDL	1.12	2.84	↓	BDL	0.42	1.92	↓	BDL	0.38	1.00	↓

Total Maximum Daily Load Development Program

Total Maximum Daily Load Status

Between April 2002 and March 2012, USEPA was under a Court Ordered Consent Decree for completion of TMDLs. Louisiana completed its Consent Decree commitments as of March 6, 2012.

Following completion of these commitments ongoing TMDL development has been focused on revising existing TMDLs where the criteria have been revised. TMDL progress is shown in Table 3.1.3. More information on USEPA's TMDL program can be found at: http://www.epa.gov/tmdl.

In addition, LDEQ began activities to prioritize work in accordance with the "Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program." More information on this vision can be obtained at: http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/CWA303dVisionProgram.aspx.

Table 3.1.3

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 01, 2014 to December 31, 2015.

Revised TMDLs Developed by LDEQ and Approved by USEPA					
Water Body	**Subsegment Number**	**Basin**	**Date Finalized**	**TMDL Parameters**	**TMDL Status**
Lower Grand/Belle River	120201	Terrebonne	9/23/2014	Dissolved Oxygen/ Nutrients	Final
Bayou Terrebonne	120301	Terrebonne	11/23/2015	Dissolved Oxygen/ Nutrients	Final

Early Warning Organic Compound Detection System

The Early Warning Organic Compound Detection System (EWOCDS) is a cooperative agreement between LDEQ, potable water works, and industries along the river. The main objective of this system is to provide warnings of possible contamination of drinking water supplies to interested parties. Currently, there are seven locations hosted by seven entities along the lower Mississippi River where ambient river water samples are collected and analyzed for the EWOCDS. For more information on EWOCDS, see http://www.deq.louisiana.gov/portal/tabid/285/Default.aspx.

Chapter 2: Water Quality Assessment Method and Integrated Report Rationale

Introduction

Statutes and Regulations

The LDEQ prepared reports to meet the requirements outlined in §303(d) and §305(b) of the federal Water Pollution Control Act (United States Code, Title 33, §1251 et seq., 1972) (commonly known as the Clean Water Act) and supporting federal regulations found in Title 40 of the Code of Federal Regulations (CFR), Parts 130.7 and 130.10 (40 CFR 130.7, 130.10). Section 303(d) of the CWA and supporting regulations require each state to identify water quality-limited segments (i.e., Louisiana subsegments that do not meet water quality standards) requiring development of TMDLs and to prioritize the water quality-limited segments for TMDL development. States are required to assemble and evaluate existing and readily available water quality-related data and information to develop the list. Additionally, each state must provide documentation to support listing decisions, including: a description of the method used to develop the list; a description of the data and information used to identify (i.e., list) waters; a rationale for any decision not to use existing and readily available data and information; and other information to demonstrate "good cause" for not including waters on the §303(d) list pursuant to 40 CFR 130.7(b)(6).

Section 305(b) of the CWA and supporting regulations require states to report on the quality of state waters every two years; the biennial reports are due April 1 of even-numbered years. Section 305(b) requires a description of all navigable waters in each state and the extent to which these waters provide for the protection and propagation of fish and wildlife and allow for recreational activities in and on the water.

Guidance

The United States Environmental Protection Agency (USEPA) issues guidance for the assessment, listing, and reporting of states' water quality to meet the requirements of CWA §303(d) (impaired waters list) and §305(b) (water quality inventory) (USEPA various dates). USEPA guidance outlines the compilation and reporting of state water quality in a combined report—the Integrated Report (IR). USEPA's guidance further outlines the use of categories to classify the quality of watersheds in each state. Integrated Report categories are outlined in Table 3.2.1.

Integrated Report Development

The 2016 IR contains new assessments for subsegments in all 12 Louisiana basins: Atchafalaya (01), Barataria (02), Calcasieu (03), Pontchartrain (04), Mermentau (05), Vermilion/Teche (06), Mississippi (07), Ouachita (08), Pearl (09), Red (10), Sabine (11), and Terrebonne (12). Due to the four-year cyclical nature of LDEQ's Ambient Water Quality Network (AWQN)

approximately ½ of the assessments for the 2016 IR will be new, while the remaining ½ will be carried forward from the 2014 IR. Data from October 1, 2011 through September 30, 2015 were used for the 2016 IR.

Table 3.2.1.

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2016 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

IR Category (IRC)	IR Category Description
IRC 1	*Specific Water body Impairment Combination* (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards. Also used for water bodies fully supporting all designated uses.
IRC 2	Water body is meeting some uses and standards but there is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 3	There is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists and a TMDL was completed for the *specific WIC* cited.
IRC 4b	WIC exists and control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited.
IRC 4c	WIC exists and a pollutant (anthropogenic source) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories represent Louisiana's §303(d) list.**
IRC 5RC (Revise Criteria)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments.
IRC 5- Alt (5-Alternative)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will implement alternative strategies under its 303(d)/Vision process to ensure the water body will meet water quality standards in the future.

Water Quality Assessment Methods

The following outlines the methods LDEQ used to develop the CWA §303(d) list and water body categorizations found in the 2016 IR. LDEQ used assessment procedures developed and updated over a number of years. Procedures followed USEPA guidance documents for §305(b) reports and §303(d) lists and USEPA's Consolidated Assessment and Listing Methodology (CALM) guidance (USEPA various dates). LDEQ based water quality assessments and §303(d) listings on specific water body subsegments as defined in Louisiana's Surface Water Quality Standards (Louisiana Administrative Code (LAC) 33:IX.1101-1123). Louisiana surface water quality standards define eight designated uses for surface waters: primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP) (with "subcategory" of limited aquatic and wildlife use (LAL)), drinking water supply (DWS), oyster propagation (OYS), agriculture (AGR), and outstanding natural resource waters (ONR). Designated uses have specific suites of ambient water quality parameters used to assess their support. Links between designated uses and water quality parameters, as well as water quality assessment procedures, can be found in Table 3.2.2. Additional details of Louisiana's IR assessment process can be found in Louisiana's Standard Operating Procedures for Production of Water Quality IR (LDEQ 2015b).

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2016 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially Supporting[2]	Not Supporting
Primary Contact Recreation (PCR) (Designated swimming months of May-October, only)	Fecal coliform[3]	0-25% do not meet criteria	-	>25% do not meet criteria
	Enterococci[4]	0-10% of single exceedances do not meet criteria; Overall geometric mean ≤ 35 cfu/100 mL	-	>10% of single exceedances do not meet criteria; overall geometric mean > 35 cfu/100 mL
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[5,6,7] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters
Secondary Contact Recreation (SCR) (All months)	Fecal coliform[3]	0-25% do not meet criteria	-	>25 % do not meet criteria
	Metals[5,6,7] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2016 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially Supporting[2]**	**Not Supporting**
Fish and Wildlife Propagation (FWP)	Dissolved oxygen (routine ambient monitoring data)[8]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Dissolved oxygen (follow-up continuous monitoring data, if needed)[8]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS, turbidity	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[5,6,7] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2016 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially Supporting[2]**	**Not Supporting**
Drinking Water Source (DWS)	Color	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Fecal coliform[3]	0-30% do not meet criteria	-	>30 % do not meet criteria
	Metals[5,6,7] and Toxics	<2 exceedances of drinking water criteria in most recent consecutive three-year period, or one-year period for newly tested waters	-	≥2 exceedances of drinking water criteria in the most recent consecutive three-year period, or one-year period for newly tested waters
Outstanding Natural Resource Waters (ONR)	Turbidity	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
Agriculture (AGR)	None	-	-	-
Oyster Propagation (OYS)	Fecal coliform[3]	Median fecal coliform ≤ 14 MPN/100 mL; and ≤ 10% of samples > 43 MPN/100 mL	-	Median fecal coliform > 14 MPN/100 mL; and > 10% of samples > 43 MPN/100 mL
Limited Aquatic and Wildlife (LAL)	Dissolved oxygen[8]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2016 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially Supporting[2]	Not Supporting

Footnotes

1. Where deviations from the decision process described in Table 2 occur, detailed information will be given to account for and justify those deviations. For instance, circumstances that may not be accounted for in the plain electronic analysis of the data will be explored and may be used to either not list the water body or to put the Water body Impairment Combination (WIC) into a different category. Those circumstances will be fully articulated.
2. While the assessment category of "Partially Supporting" is included in the statistical programming, any use support failures will be recorded in the Assessment Database (ADB) as "Not Supporting." This procedure was first adopted for the 2002 §305(b) cycle because "partially supported" uses receive the same TMDL treatment as "not supported" uses.
3. For most water bodies, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; OYS, 43 colonies/100 mL (see LAC 33:IX.1123).
4. For enterococci, Louisiana Department of Health and Hospitals (LDHH's) single sample criterion for beach monitoring is 130 colony forming units (cfu)/100 mL. For marine waters, the geometric mean criterion over the period of record is 35 cfu/100 mL. LDHH beach data only applies to the LDHH monitored beaches. Refer to page 15 for details.
5. Determination of the application of marine or freshwater metals criteria is made based on LAC 33:IX.1113.C.6.d.
6. Parameters collected quarterly (metals and organics) required a minimum of three samples.
7. Beginning in April 2013, LDEQ resumed ultra-clean metals sampling at selected sites across the state. Sites were selected based on previous Water Quality IR assessments showing impairment for one or more metals. Ultra-clean metals sampling is conducted by the Water Surveys Section under Quality Assurance Project Plan (QAPP)_1031_03 (LDEQ 2015c). The QAPP is available through LDEQ's Electronic Document Management System (EDMS) as document # 9626986. EDMS can be found at: http://www.deq.louisiana.gov/portal/ONLINESERVICES/ElectronicDocumentManagementSystem.aspx.
8. In the event that analysis of routine ambient monitoring data for dissolved oxygen results in partial- or non-support, continuous monitoring (CM) data, where available, was used for follow-up assessment. CM data runs were approximately 48-72 hours in duration. CM data was evaluated as follows: All of the 15-minute interval dissolved oxygen observations from a CM sample run were analyzed to determine if more than 10% of the data points were below minimum criteria. Water bodies that fell below the criteria greater than 10% of the time were reported as IRC 5 and are therefore on the §303(d) list. Water bodies that fell below the criteria less than or equal to 10% of the time were placed in IRC 1, fully supported. If ambient monitoring indicated impairment and CM data was not available for analysis, the water body was placed in IRC 5 until CM data can be collected during the critical season of May 1 through October 31. In some cases, CM data was not collected because it was determined by LDEQ headquarters and regional staff that CM data collection efforts were not warranted due to conditions in the field.

Water Quality Data and Information

LDEQ prepared assessments using existing and readily available water quality data and information in order to comply with rules and regulations under §303(d) of the CWA (33 U.S. Code §1313 and 40 CFR 130.7). LDEQ used monitoring procedures and data for the 2016 IR that remained essentially the same as those used to collect data for the 2014 IR.

LDEQ primarily relied on data and information supplied through LDEQ's routine ambient monitoring program to conduct water quality assessments for the 2016 IR. LDEQ conducts monitoring on nearly all water quality subsegments on a four-year statewide monitoring cycle. Approximately one-quarter of the state's subsegments are monitored each year; a limited number of subsegments are monitored (and continue to be monitored) every year (i.e., long-term monitoring stations). Each monitoring cycle or "water-year" begins in October and ends in September of each year; concluding the monitoring cycle in September allows time to process data and generate the IR by April 1 of even-numbered years. LDEQ collected monthly and quarterly (metals and organics) water quality data (LDEQ 2010; LDEQ 2014a; LDEQ 2014b; LDEQ 2015b; LDEQ 2015c); ambient water quality data are available on LDEQ's website at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2421.

LDEQ compiled and assessed data from the AWQMN collected between October 1, 2011 and September 30, 2015; up to four years (48 samples) of data were available for subsegments with long-term monitoring sites (LDEQ 2014a; LDEQ 2015b).

Subsegments with Downstream or Upstream Monitoring Sites

LDEQ used ambient monitoring data and information collected from within or immediately downstream or upstream of a water body subsegment to evaluate each of the subsegment's designated uses, using the decision processes shown in Table 3.2.2 ("immediately downstream" typically means within approximately 600 yards (0.34 miles) or less of the subsegment boundary). Four subsegments used for the 2016 IR had sites immediately downstream or upstream of the subsegment boundary; in each case there were no known inputs between the subsegment boundary and the sample site. One subsegment had a site immediately upstream of the subsegment boundary (0.28 mile). Six subsegments had sample points between one and five miles downstream from the subsegment boundary. One subsegment had a site located in the coastal waters, and the flow would be largely influenced by tidal activity. One subsegment had a sample point 6.7 miles downstream. In each case, there were no reasonable alternatives for sampling at or above the subsegment boundary, and each site was determined to be representative of the assessed subsegment.

Subsegments with Long-Term Monitoring Sites

LDEQ collected data at 21 sites in subsegments with long-term monitoring stations. LDEQ applied assessments for a monitoring station indicating use impairment to the entire subsegment, even if the second monitoring station did not indicate use impairment.

Metals

Beginning in April 2013, LDEQ resumed ultra-clean metals sampling at selected sites across the state. Sites were selected based on previous Water Quality IR assessments showing impairment for one or more metals. Ultra-clean metals sampling was conducted by the Water Surveys

Section under QAPP_1031_03 (LDEQ 2015c). The QAPP is available through LDEQ's EDMS as document # 9626986. EDMS can be found at: http://www.deq.louisiana.gov/portal/ONLINESERVICES/ElectronicDocumentManagementSystem.aspx. Metals data was assessed using the decision processes shown in Table 3.2.2.

Dissolved Oxygen

Beginning in 2008, LDEQ from time to time collected two sets of data to conduct DO assessments. If routine ambient monitoring DO data indicate potential impairment of the use, LDEQ may collect and use continuous monitoring DO data sets to make a final determination on use support. Continuous monitoring data allows evaluation of the 24-hour diurnal DO fluctuations and an improved determination of whether the frequency of DO exceedances is impairing the use (LDEQ 2010). Deployment of continuous monitors was also dependent on available resources and a determination of whether collecting the extra data set was appropriate (e.g., if stream impairment was already known, there was no benefit to be gained by deploying a continuous monitor until additional pollution control measures were implemented). In some cases it was determined that conditions in the water body were severly impacted by drought or other natural or anthropogenic conditions. If such conditions were considered severe enough, it was determined the subsegment would be unable to attain DO criteria even with the use of continuous monitoring. In these cases continuous monitors were not deployed in order to reduce costs and eliminate risk to equipment.

Coastal Subsegments with Shared Monitoring Sites

LDEQ evaluated coastal subsegments for the potential to have shared data points for contiguous and similar subsegments. This was done to address subsidence and other land-altering activities that have created open water areas between subsegments that were previously separated by land. Paired and/or adjacent subsegments were sampled on an alternating basis (one subsegment sampled one month, the similar subsegment sampled the next month) beginning in the 2010/2011 ambient monitoring cycle (Table 3.2.3). For the 2016 IR, all historical data for each site/subsegment for dissolved oxygen, turbidity, pH, temperature, salinity, alkalinity, and hardness and all fecal data from 2004 to present was analyzed to determine which sites/subsegments were not significantly different statistically and, therefore, could be combined for assessment purposes. The addition of salinity, alkalinity, and hardness to the analysis, outside of the assessed parameters, provides further support to the validity of the shared monitoring approach. Each set of paired subsegments was analyzed using a non-parametric randomized complete block design, or Friedman test. Year was used as a block to reduce the variability between each site/subsegment comparison. Each parameter was analyzed individually and the resulting p-value (α=0.05) was adjusted using the Bonferroni-Holm method (Holm 1979). Any paired site/subsegment having at least one significant value was considered as statistically significant and the site/subsegments were assessed separately. Paired sites/subsegments not statistically significant for all parameters were assessed together. The data assessed were from October 1, 2011, to September 30, 2015. One site/subsegment had only four sampling dates during this timeframe, and was not assessed (results are presented for general knowledge). Only four site/subsegment(s) had criteria for turbidity. The percentages of site/subsegment(s) exceeding the criteria are presented in Table 3.2.4.

Table 3.2.3

List of paired coastal subsegments/sites used for shared water quality monitoring and assessment.

Subsegment	Site	Subsegment	Site
010901	1204	042205	1088
061002	0692	042206	1087
041701	0035	060803	0678
041704	1072	060804	0679
042104	0007	061104	0316
042102	1080	061001	0691
042201	1090	110303	1158
042202	1082	110304	1159
042203	1089	120406	0937
042204	1091	120708	0955
042207	1083	120802	0958
042208	0006	120804	0960
		120803	0959

Table 3.2.4.

The exceedance percentage for each water quality parameter and subsegment(s) pair from the period of October 1, 2011, to September 30, 2015. Subsegments that are fully supported are labeled as "0% FS," whereas subsegments not fully supported are labeled as "X% NS," where *X* is the percentage of exceedances. Subsegments paired together were not significantly different statistically; therefore, data from both subsegments were used for the assessment. See text for description of statistical analysis performed. Subsegments and parameters containing less than five data points were deemed to have insufficient data (INSD); however, the exceedance percentage is listed for information purposes.

		Water Quality Parameters					
Subsegment	Site	Dissolved Oxygen	Fecal OYS	Fecal PCR and SCR	pH	Turbidity	Temperature
010901	1204						
061002	0692	0% FS	no data	no data	0% FS	--	0% FS
041701	0035						
041704	1072	0% FS	N/A [b]	0% FS	0% FS	0% FS	0% FS
042104	0007	0% FS	0% FS	0% FS	0% FS	--	0% FS
042102	1080	0% FS	0% FS	0% FS	0% FS	0% FS	0% FS
042201	1090						
042202	1082	0% FS	0% FS	0% FS	0% FS	--	0% FS
042203	1089						
042204	1091	0% FS	0% FS	0% FS	0% FS	--	0% FS
042207	1083						
042208	0006	0% FS	0% FS	0% FS	0% FS	--	0% FS
042205	1088						
042206	1087	0% FS	0% FS	0% FS	0% FS	--[1]	0% FS
060803	0678			INSD			
060804	0679	0% FS	N/A[2]	0% FS	0% FS	42% NS	0% FS
061104	0316	0% FS	50% NS	0% FS	0% FS	--	0% FS
061001	0691	0% FS	50% NS	0% FS	0% FS	--	0% FS
110303	1158	0% FS	67% NS	0% FS	0% FS	0% FS	0% FS
110304	1159	0% FS	83% NS	0% FS	0% FS	0% FS	0% FS
120406	0937						
120708	0955	0% FS	0% FS	0% FS	0% FS	--	0% FS
120802	0958						
120804	0960	0% FS	0% FS	0% FS	0% FS	--	0% FS
120803	0959	INSD, 0% FS					

1. There is no turbidity criteria for these sites.
2. The most stringent designated use for these sites is primary contact recreation, all others are oyster propagation.

External Data and Information

LDEQ's routine ambient monitoring data (described above) provided the primary set of data and information used for water quality assessments and listing decisions. However, LDEQ also used external data sets and information.

LDEQ used LDHH fishing and swimming advisory information and enterococci and fecal coliform bacteria data sets collected for the state's Beach Monitoring Program. For water bodies within a subsegment with fish consumption or swimming advisories, the advisory water body was also named in the 2016 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment.

LDEQ evaluated the LDHH beach monitoring data based on the federally-promulgated enterococci criteria for Louisiana and used by LDHH for determining beach closures. USEPA uses a single sample criterion of 130 colony forming units (cfu)/100 mL. For marine waters, a geometric mean > 35 cfu/100 mL over the period of record used for the IR results in an impairment. Enterococci data collected as part of LDHH's beach monitoring were evaluated using USEPA's new assessment rule of 10%. Under this rule, if more than 10% of samples exceed the statistical threshold value of 130 cfu/100 mL over the period of record used for the IR, then an impairment for enterococci is reported. If the enterococci geometric mean was > 35 cfu/100mL over the period of record used for the IR, then an impairment is reported. Duplicate samples in the dataset were treated as QC samples and were not averaged with the target sample to keep evaluation methods consistent with LDEQ protocol.

Finally, LDEQ solicited data and information from the public. LDEQ published a request for data and information during a 30-day public notice period which ended December 2, 2015. No additional data was provided at the conclusion of the public notice period.

Rationale for Not Using Readily Available Data and Information

In accordance with LDEQ's QAPP for the AWQMN (LDEQ 2014a) approved by USEPA-Region 6, LDEQ required at least five data points for parameters collected monthly and a minimum of three data points for parameters collected quarterly; otherwise, insufficient data were available for assessment purposes. LDEQ conducted additional evaluations of data sets to determine usability in accordance with standard operating procedures for the IR (LDEQ 2015b) and data quality objectives outlined in the QAPP cited above. Data quality issues that may have necessitated qualifications to data sets resulting in limited and/or no usability include, but are not limited to: limited geospatial data and/or representativeness; limited temporal data and/or representativeness; limited quality control data; and quality control data indicating data that are of limited use (e.g., blank contamination, incorrect laboratory procedures).

Good Cause for Not Listing Waters

In accordance with CWA §303(d) and federal regulations, LDEQ listed waters as impaired and requiring TMDL development (IRC 5, IRC 5RC, and IRC 5-Alt; see Table 3.2.1) if sufficient data of appropriate quality were available. Conversly, if insufficient data was available through LDEQs ambient water quality monitoring or other sources, then the water body was reported as unassessed or prior IR assessments were carried forward.

Coastal Subsegments Affected by Oil Spill and/or Cleanup Activities

On April 20, 2010, BP's Deepwater Horizon drilling rig operating in the Gulf of Mexico approximately 50 miles off the Mississippi River delta exploded and sank. This triggered an oil spill from the damaged riser at the bottom of the Gulf that continued until August 4, 2010 when a static kill procedure effectively closed the well. The well was then cemented and permanently closed by September 19, 2010. The resulting oil spill affected a large portion of Louisiana's coastline. LDEQ and other agencies continue to analyze the impact of the spill on Louisiana's coastal waters. Results of this analysis will be presented in future reports by LDEQ as well as by other national and state agencies and academic researchers.

For the 2012 IR, LDEQ estimated that 42 coastal area subsegments were impaired by the oil spill and associated cleanup activities. LDEQ assessed these subsegments as being potentially and/or temporarily impaired for FWP, OYS, and/or PCR. The suspected impairments were based on fish, crab, shrimp, and shellfish closures issued by LDWF and LDHH, as well as Shoreline Cleanup and Assessment Technique (SCAT) Team surveys of the region. Closure information was taken from the Environmental Response Management Application (ERMA) Gulf Response Website (National Oceanic and Atmospheric Administration (NOAA) 2010).[3]

With the 2014 IR, LDEQ reduced both the number and size of subsegments assessed as impaired by residual surface and sub-surface oil/tar balls/tar mats. This was done based on more recent SCAT Team surveys available at that time. The aerial extent of impairment was significantly reduced or elimintated in each of the previously impaired subsegments. For the 2016 IR, the following sections outline the most recent assessment of these areas.

Fish and Wildlife Propagation and Oyster Propagation Uses

During development of the 2016 IR, LDEQ reviewed the LDWF and LDHH fishing and oyster closure areas to determine if oil spill-related closures remain in effect. This review identified that all LDWF and LDHH commercial fishing closures for finfish, shellfish, and oysters have been rescinded. As a result, all spill-related FWP and OYS impairments originally reported in the 2012 and 2014 IRs have been changed to full support due to lifting of the LDWF and LDHH fishing closures. Refer to the LDWF Oil Spill Response website for full details on the revised fishing closures (http://www.wlf.la.gov/oilspill).

[3] Disclaimer: The analysis of water quality contained in this report does not rely on information collected as part of the Deepwater Horizon Natural Resource Damage Assessment (NRDA), and is not intended to analyze impacts resulting from the Deepwater Horizon oil spill and related response for NRDA purposes.

Primary Contact Recreation

Among the 42 subsegments first reported as impaired due to oil spill impacts in the 2012 IR, for the 2014 IR LDEQ identified 22 partial subsegments for suspected impairment of the designated use of PCR. Suspected PCR impairments were based on the location of SCAT oiling observations found on the ERMA Website (NOAA 2010).

For the 2016 IR, LDEQ evaluated the latest LDEQ monitoring for the region conducted through October 2015. Based on this review, six limited portions of subsegments have been assessed as being potentially and/or temporarily impaired for PCR. As with the 2014 IR assessments, the 2016 IR assessments represent only specific and limited portions of full subsegments. Table 3.2.5 contains the list of these partial subsegments. The portions of subsegments identified in Table 3.2.5 are areas found to still have oil, tar mats, or tar balls present. The areas of the subsegments affected are shown in Figure 3.2.1. The full subsegments are assessed based on routine ambient monitoring data or in some cases other information. These six portions of subsegments were placed in IRC 4b. The suspected causes of impairment will be reevaluated for the 2018 IR based on possible future LDEQ monitoring or other surveys of the area.

All partial subsegments no longer impaired for PCR or FWP in the 2016 IR will be listed in the Appendix B-Category 1 Addendum of the final 2016 IR when it is released. Appendix B lists all suspected causes of impairment from the 2014 IR that are no longer impaired for the 2016 IR.

Other water quality impairments in the impacted region not related to the oil spill may or may not still be present on these subsegments. These will be handled according to normal IR procedures.

Table 3.2.5.

Partial subsegments suspected of impairment to primary contact recreation use due to ongoing indications of oiling based on SCAT surveys following the Deepwater Horizon oil spill.[1]

Partial Subsegment Number	Partial Subsegment Description
LA021101_005	Shoreline and open water areas within 100 yards of shorelines near Bay Jimmy and St. Mary's Point, within northern LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.
LA021101_006	Gulf side of Grand Terre II Island, approx. 500 meters of open beach and adjacent waters, eastern tip of island, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.
LA021101_007	Gulf side shoreline of eastern tip of Elmers Island, 500 meters of open beach and adjacent waters, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.
LA021101_008	Back bay side of Elmers Island, approximately 400 meters of isolated areas of open beach and adjacent waters, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.

Table 3.2.5.

Partial subsegments suspected of impairment to primary contact recreation use due to ongoing indications of oiling based on SCAT surveys following the Deepwater Horizon oil spill.[1]

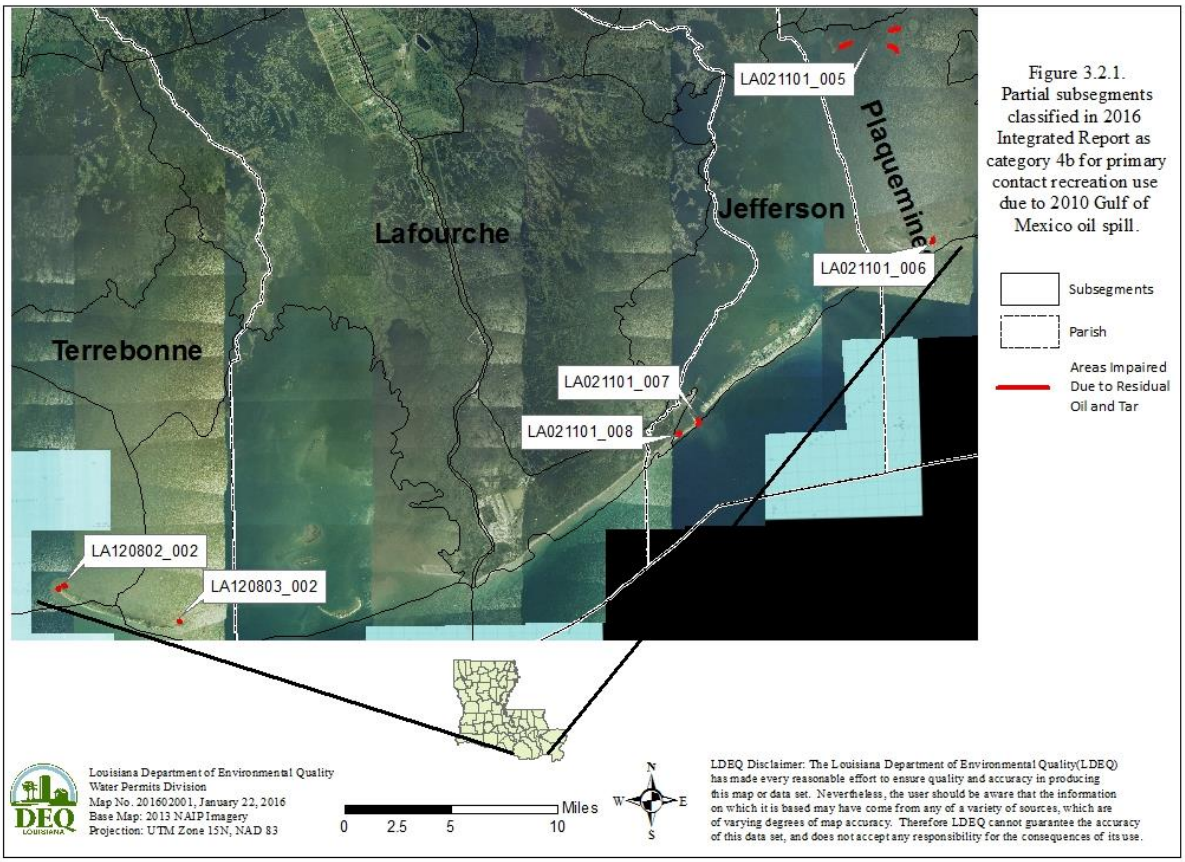
Partial Subsegment Number	Partial Subsegment Description
LA120802_002	Gulf side of West Timbalier Island, 200m of beach face along western tip of island, within southeast area of LA120802_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.
LA120803_002	Bay side of West Timbalier Island, at eastern end of island, within southern area of LA120803_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies.

To better reflect current conditions in these subsegments, the suspected cause of impairment was reported as:

Cause Name	Cause Description
Residual Surface and Sub-surface Oil/Tar Balls/Tar Mats	Remnant oil, tar balls, or tar mats remaining on shoreline/intertidal areas following past open water oil spills.

The suspected source of impairment will be:

Source Name	Source Description
Accidental Release/Spill/Petroleum/Natural Gas Well	Accidental release/spill: Unintentional release of a substance/pollutant from a petroleum/natural gas well to the surrounding environment



Coastal Louisiana Dissolved Oxygen Study and Assessment

In order to better understand depth profile DO levels in Louisiana waters, starting in December 2014 LDEQ initiated data collection for DO and related in situ meter data to expanded spatial and temporal coverage for these parameters. Data was collected in three subsegments of Louisiana's state territorial waters of the Gulf of Mexico:

LA021102_00 – Barataria Basin Coastal Bays and Gulf Waters to the State 3-mile limit

LA070601_00 – Mississippi River Basin Coastal Bays and Gulf Waters to the State 3-mile limit

LA120806_00 – Terrebonne Basin Coastal Bays and Gulf Waters to the State 3-mile limit

In particular, the data was used to characterize and assess DO concentrations at multiple depths and times of year in order to contribute to characterizing the depth profile observations for DO, salinity, temperature and related parameters in Louisiana territorial waters.

Electronic meter readings were taken at one meter intervals beginning at one meter below the surface and extending to approximately one to 0.5 meter above the bottom. Each subsegment in the study had a total of eight sample sites located along two transects running approximately parallel to the coast. Each transect had four sample sites (Figure 3.2.2, Table 3.2.6).

Sample runs were conducted quarterly in each subsegment over a 12-month period. Subsegments were rotated on a monthly basis, such that the first subsegment was sampled in December, the

second in January, the third in February, then returning to the first subsegment in March. This pattern was repeated until all three subsegments were sampled a total of four times through the 12-month period. Sample dates within the month for each subsegment varied according to weather conditions in the Gulf of Mexico and the work schedule of field staff responsible for the sampling. All sampling was completed in November of 2015. Subsegments and dates sampled are listed in Table 3.2.7. February and May sampling events were delayed to the following months due to weather related safety concerns.

For 2016 IR assessment purposes, dissolved oxygen data was analyzed using the routine criterion assessment procedure for dissolved oxygen. Under this procedure, if more than 10% of the cumulative data collected over the course of the one-year study in a particular subsegment fell below the DO criterion of 5.0 mg/L, then the subsegment was reported as not supporting its FWP use. Data from all sites, depths, and dates for each subsegment were combined to assess each subsegment separately. Based on the data, subsegments LA021102_00 (Barataria coastal subsegment), and LA070601_00 (Mississippi coastal subsegment) did not meet the DO criterion for FWP. For the Barataria coastal subsegment a total of 36.7% of DO results were < 5.0 mg/L, while in the Mississippi coastal subsegment a total of 42.7% of DO results were below the criterion. The Terrebonne coastal subsegment (LA120806_00) was found to be fully supporting the DO criterion for FWP with only 6.0% of results below the DO criterion.

As a result, LA021102_00 and LA070601_00 were reported as impaired for FWP in the 2016 IR. LA120806_00 was reported as fully supporting FWP. In both the 2012 and 2014 IRs all three of these subsegments were reported as insufficient data (IRC 3) by LDEQ; however, this decision was overturned by USEPA, which assigned the subsegments to IRC 5 (TMDL required). For the 2016 IR, LDEQ has determined the most appropriate Integrated Report Category for the two subsegments not meeting the DO criterion is IRC 5RC (revise crieria). This decision is based on the following discussion.

As part of the sampling effort described above, salinity and temperature readings were collected along with DO. During the course of the field sampling and preliminary data analysis it was quickly recognized that salinity, in particular a sharp salinity increase or halocline with increasing depth, was a primary contributor for many of the low DO readings at greater depths below the surface.

Figures 3.2.3, 3.2.5, and 3.2.7 are examples of the apparent effect of salinity, temperature and pressure on DO. The combination of these three parameters, density, is expressed as Sigma-t and shows a corresponding pycnocline. The charts are for all eight sites on various months in the three coastal subsegments studied. Each of the charts shows a sharp halocline and pycnocline at a depth of between three and seven meters, depending on the subsegment, site and overall depth.

Figure 3.2.2.

Sample sites for Coastal Louisiana Dissolved Oxygen Study, December 2014 – November 2016.

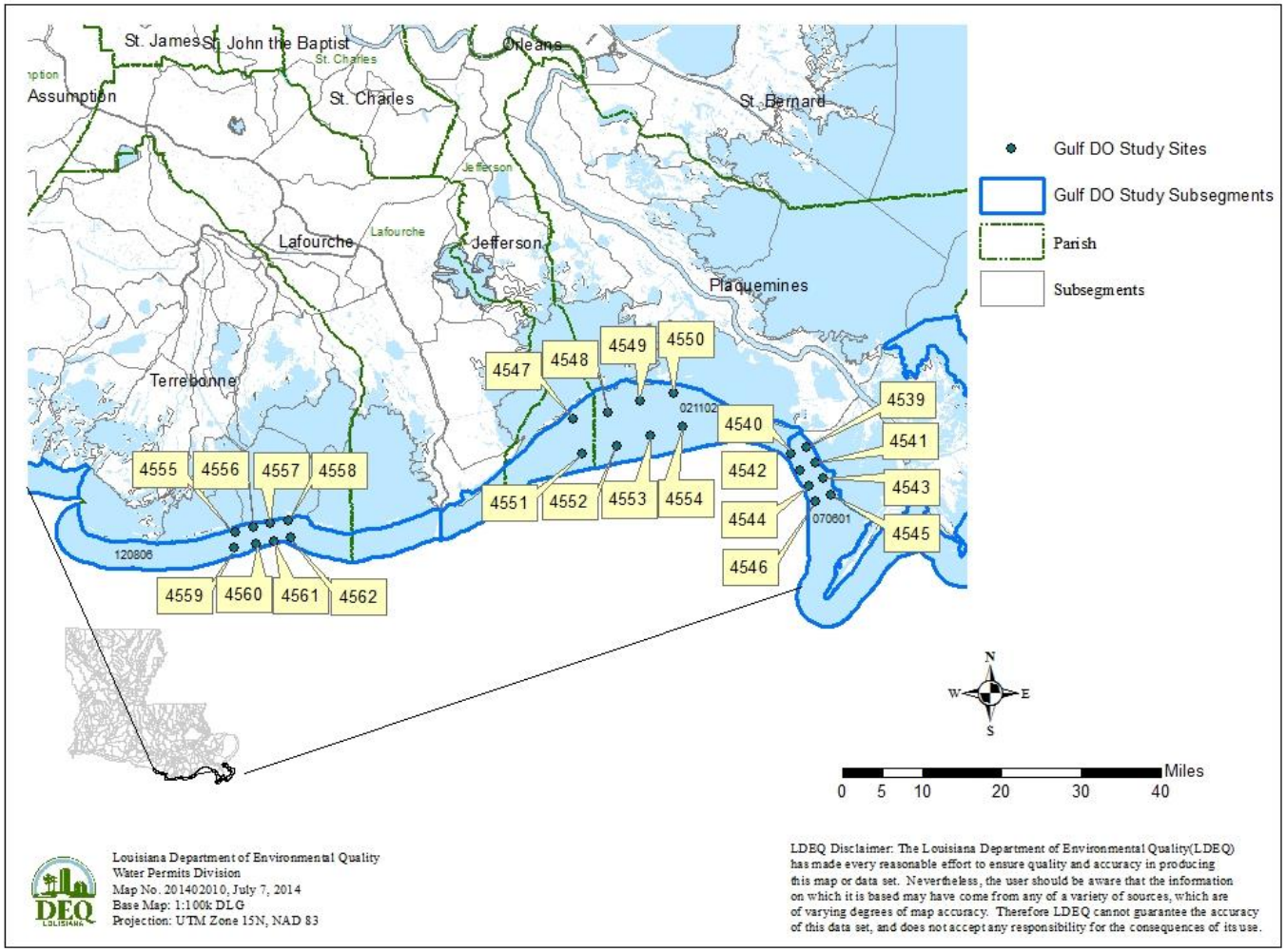


Table 3.2.6.

Site number and coordinates for sample sites used in Coastal Louisiana Dissolved Oxygen Study, December 2014 – November 2015.

Subsegment Number	LDEQ Site Number	Inner or Outer Transect	Latitude	Longitude
LA021102_00	4547	Inner	29.2432	-89.9433
LA021102_00	4548	Inner	29.2562	-89.874
LA021102_00	4549	Inner	29.2725	-89.805
LA021102_00	4550	Inner	29.2862	-89.734
LA021102_00	4551	Outer	29.1805	-89.9272
LA021102_00	4552	Outer	29.1939	-89.8563
LA021102_00	4553	Outer	29.2109	-89.7856
LA021102_00	4554	Outer	29.2242	-89.7176
LA070601_00	4539	Inner	29.182	-89.4621
LA070601_00	4541	Inner	29.153	-89.446
LA070601_00	4543	Inner	29.1244	-89.4295
LA070601_00	4545	Inner	29.0936	-89.4143
LA070601_00	4540	Outer	29.1684	-89.4943
LA070601_00	4542	Outer	29.1389	-89.478
LA070601_00	4544	Outer	29.1099	-89.4617
LA070601_00	4546	Outer	29.0808	-89.4477
LA120806_00	4555	Inner	29.0536	-90.652
LA120806_00	4556	Inner	29.0614	-90.6141
LA120806_00	4557	Inner	29.0673	-90.5775
LA120806_00	4558	Inner	29.0714	-90.5417
LA120806_00	4559	Outer	29.0234	-90.6542
LA120806_00	4560	Outer	29.0296	-90.6079
LA120806_00	4561	Outer	29.0353	-90.5724
LA120806_00	4562	Outer	29.0394	-90.5362

Table 3.2.7.

Subsegments and sample dates for nearshore Gulf of Mexico dissolved oxygen profile study.

Coastal Mississippi (LA070601_00)	Coastal Barataria (LA021102_00)	Coastal Terrebonne (LA120806_00)
December 18, 2014	January 29, 2015	March 2, 2015
March 24, 2015	April 23, 2015	June 19, 2015
June 30, 2015	July 10, 2015	August 14, 2015
September 18, 2015	October 7, 2015	November 24, 2015

The haloclines are marked by a rise in salinity from approximately 15 parts per thousand (ppt) at and above three meters to > 30 ppt one to two meters deeper. In many cases the salinity changed abruptly within the span of approximately one meter. Temperature showed a reversed but less pronounced change, with temperature falling slightly at approximately the same depth. In each of these cases the DO concentrations went from > 5.0 mg/L (meeting criterion) to < 4.0 mg/L (not meeting criterion). For many of the months and sites with strong haloclines DO dropped from meeting the criterion near the surface to < 1.0 mg/L near the bottom of the water column.

By contrast, Figures 3.2.4, 3.2.6, and 3.2.8 are examples of either the lack of, or a more moderate, halocline for the same subsegments but different months. For the Barataria and Terrebonne subsegments, Figures 3.2.4 and 3.2.8, there is little or no substantial rise in salinity at any of the sites and subsequently no marked decrease in DO, with no DO concentrations below 5.0 mg/L. However, for the Mississippi subsegment, Figure 3.2.6, while the halocline is less pronounced than in Figure 3.2.5, there is still a substantial rise in salinity with a corresponding decline in DO. Among all three subsegments, the Mississippi subsegment shows the most visually pronounced haloclines across all sites and dates when reviewing the figures. These pronounced haloclines appear to be associated with the greatest drop in DO through the water column.

This last finding agrees with the Mississippi subsegment having the highest number of criterion failures overall, with 42.7% of DO readings falling below 5.0 mg/L. The Barataria subsegment had the next lowest number of sample sites with a significant halocline effect, resulting in a lower number of DO readings, 36.7%, below 5.0 mg/L. Finally, the Terrebonne subsegment, which is furthest from the Mississippi River discharge, had the lowest number of significant haloclines in the data and was found to be fully supporting the DO criterion with only 6.0% of DO readings below 5.0 mg/L.

Due to the high freshwater input from the Mississippi River, the Mississippi coastal subsegment experienced the most pronounced salinity gradients, ranging from near 0.2 ppt at the top of the water column to 38.2 ppt near the bottom. This occurred across all sites and dates. For a single site and date within the subsegment, the greatest range was from 0.4 ppt near the top to 37.9 ppt near the bottom in water approximately 7.0 m deep. This occurred on March 24, 2015. The corresponding DO concentrations ranged from 0.1 mg/L near the bottom to 9.7 mg/L at a depth

of 1 m. The sample date of March 24, 2015 also corresponded with nearly the highest discharge rate from the river for 2015.

While more investigation is needed on the mechanics and variability of halo/pycnocline development, it appears that the Mississippi River, through both discharge flow and distance from the subsegments, has a large effect on the establishment of strong haloclines. Strong haloclines in turn have a large effect on the resulting low DO readings near the bottom of the water column.

In addition to DO and salinity, Figures 3.2.3 – 3.2.8 also show density as Sigma-t. Density Sigma-t is a calculated value that takes into account the temperature, salinity, and pressure of a water sample at the time of sampling. The density for the majority of the samples strongly track the corresponding salinity, indicating that salinity was the primary driver of the stratification of nearshore waters during this study. Based on this relationship, salinity and density are believed to be strong components among the causes for low DO at greater depths when a halo/pycnocline is established.

Across all three subsegments and all dates, nine of twelve sampling events (runs) resulted in DO values < 5.0 mg/L. During one of these nine runs only one of eight sites had DO values < 5.0 mg/L. This occurred in the Terrebonne coastal subsegment on June 19, 2015. That one site had two results < 5.0 mg/L but $\geq$ 4.3 mg/L. A slight but apparent halocline effect was seen. All other sites that day had relatively uniform salinity from top to bottom at approximately 18-20 ppt. The remaining three sample runs without DO values < 5.0 mg/L occurred in January (Barataria), March and November (both Terrebonne).

While more investigation is needed, this halocline/pycnocline stratification is believed to be caused in part by differences in wind and wave patterns at the surface. In many cases, when the halocline was evident surface conditions were relatively calm, resulting in less mixing of the water column, particularly at greater depths. When no halocline was evident surface water conditions tended to be rougher, with higher seas. For example, on the last sample collection date of November 24, 2015 seas were reportedly running at six to eight feet, much rougher than normal. During that time, no halocline was noted and all DO results were > 7.0 mg/L. Another component under investigation is the effect of tidal period on the establishment of haloclines. There is some evidence that during periods of high tidal movement, both rising and falling tides, there were fewer strong haloclines and, therefore, fewer cases of low DO below the surface waters. By contrast, during periods of slack tide, both high and low tides, there appears to be more opportunity for strong haloclines to set up in the water column. Both meteorlogical and hydrographic components will be further developed in the final report on the Gulf DO study. Nutrient concentrations are likely to be another factor in the DO concentrations found during the study; however, nutrients were not sampled as part of this study.

Figure 3.2.3. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Barataria Coastal subsegment (LA021102_00) on April 23, 2015. Not supporting DO with 42.9% below 5.0 mg/L criterion.

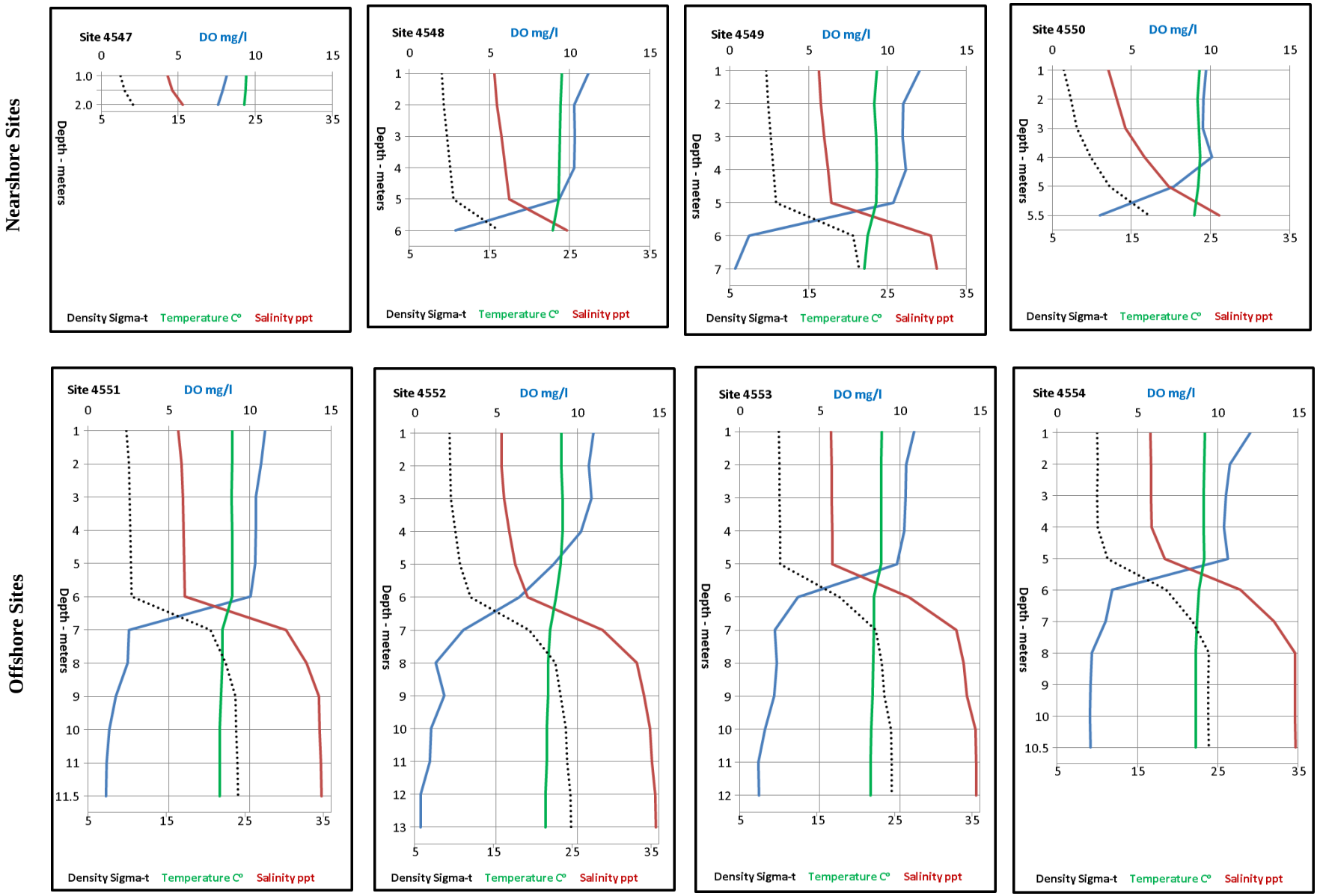
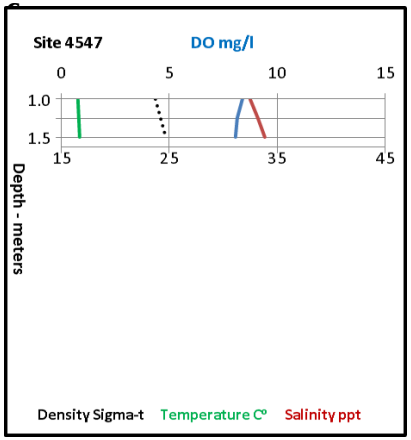
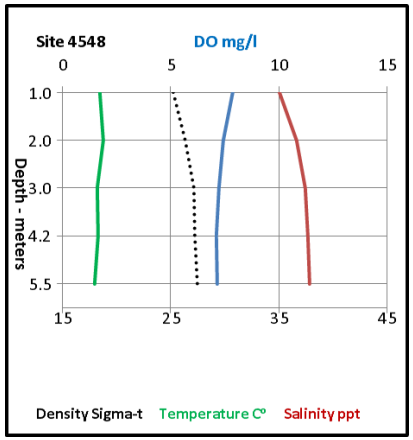
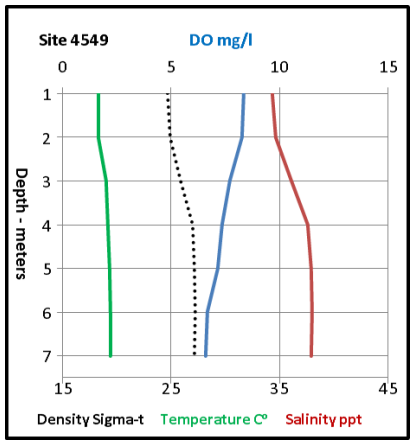


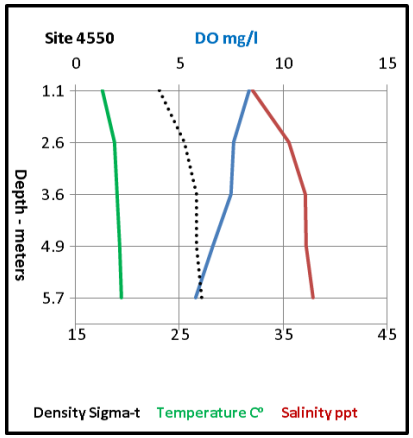
Figure 3.2.4. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Barataria Coastal subsegment (LA021102_00) on January 29, 2015. Fully supporting DO criterion with 0% below 5.0 mg/L

Nearshore Sites

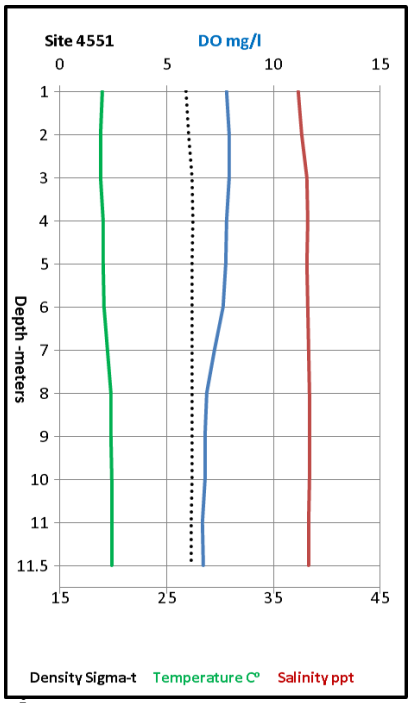


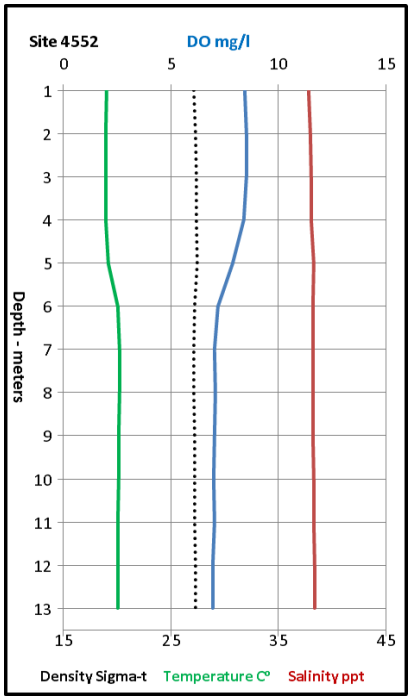


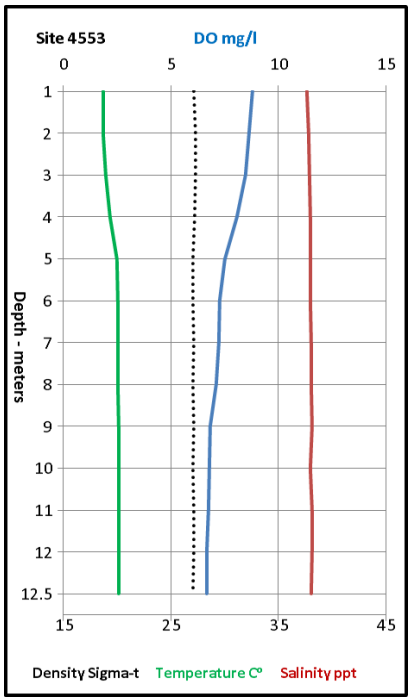




Offshore Sites







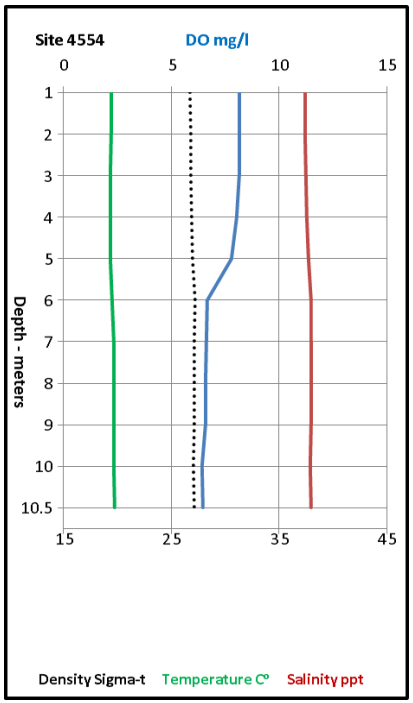


Figure 3.2.5. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Mississippi Coastal subsegment (LA070601_00) on March 24, 2015. Not supporting DO with 64.1% below 5.0 mg/L criterion.

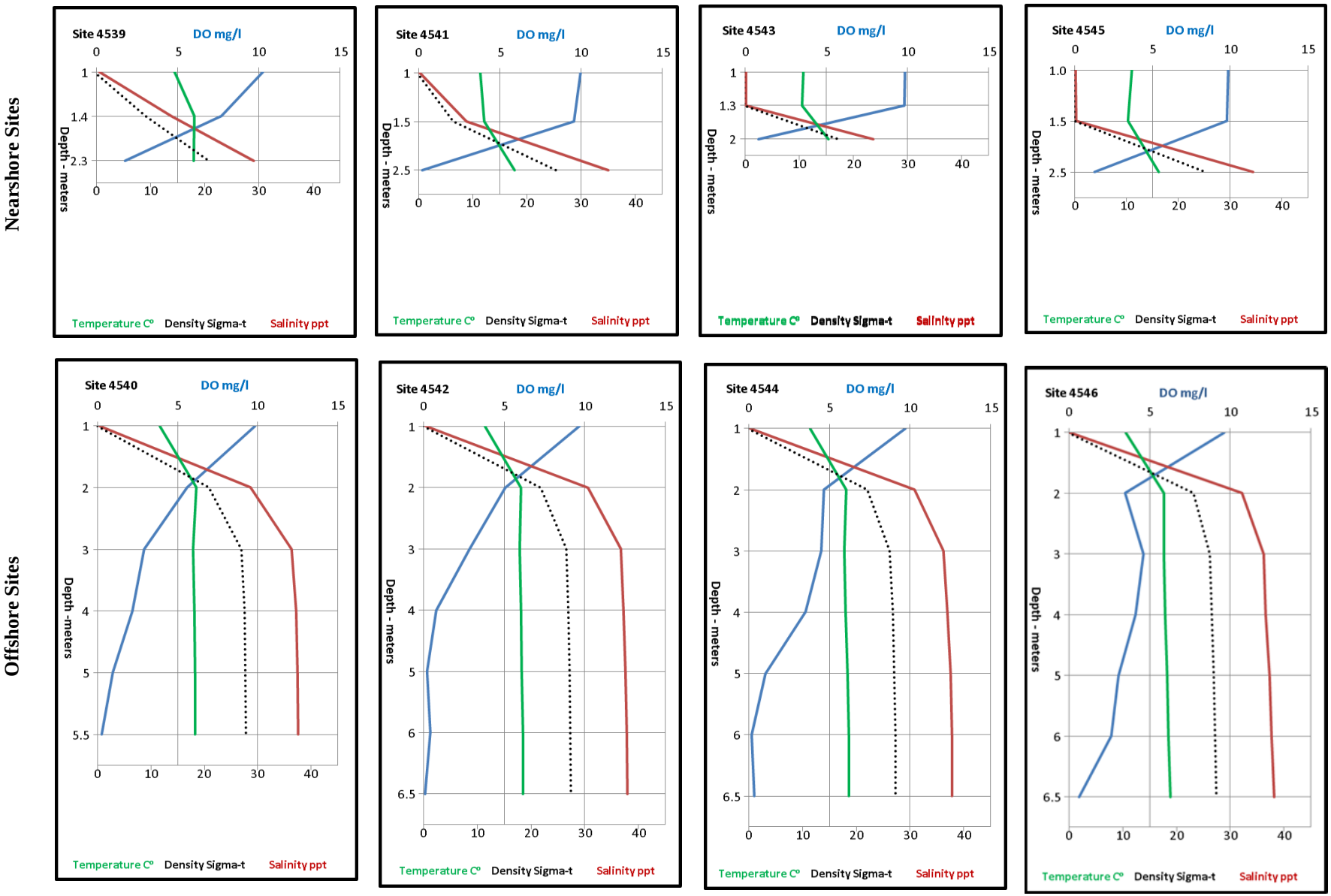
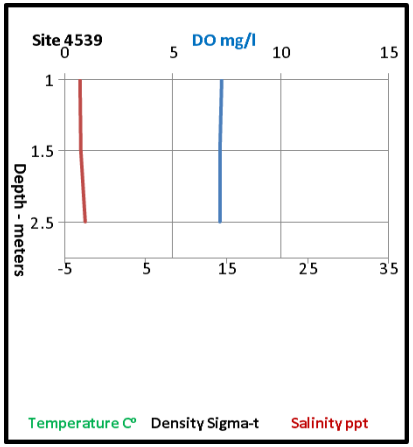
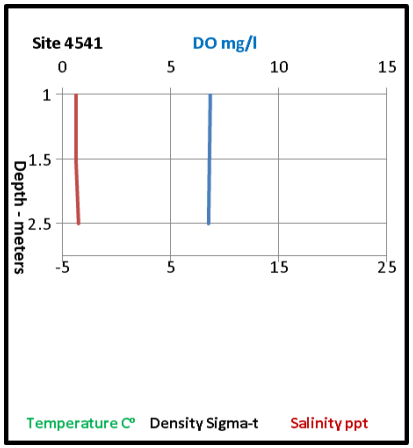
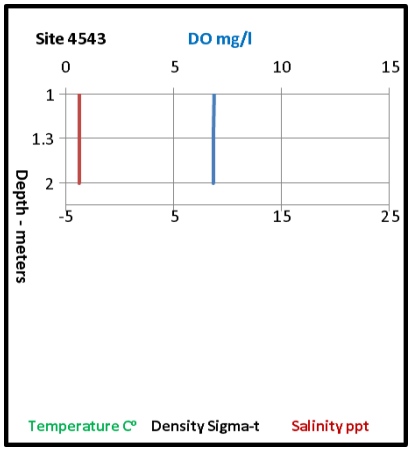


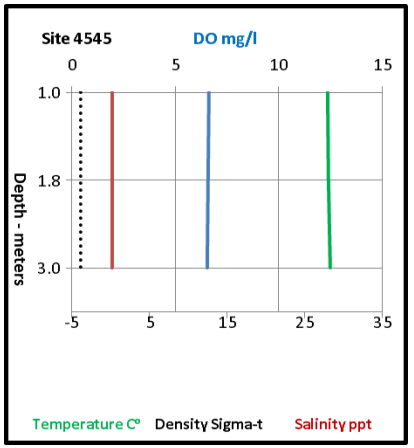
Figure 3.2.6. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Mississippi Coastal subsegment (LA070601_00) on June 30, 2015. Not supporting DO with 15.0% below 5.0 mg/L criterion.

Nearshore Sites

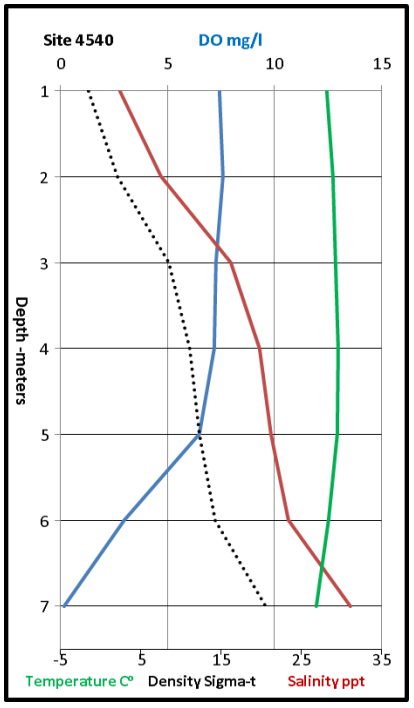


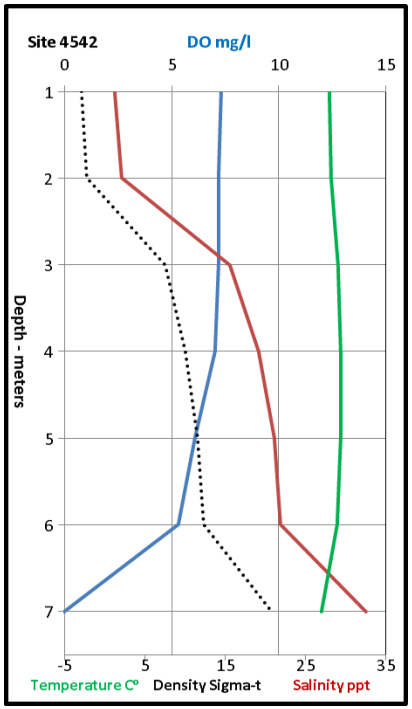


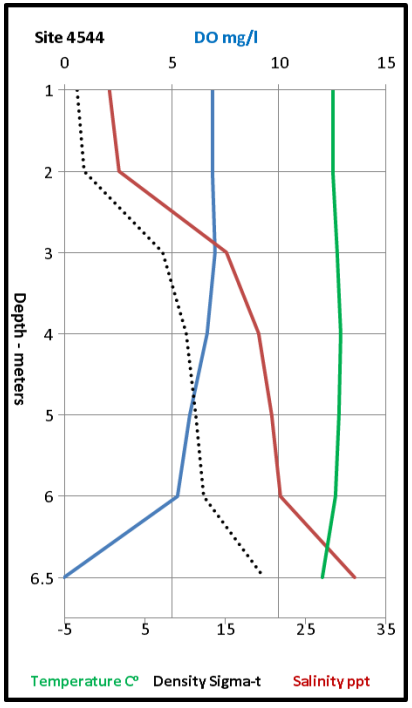




Offshore Sites







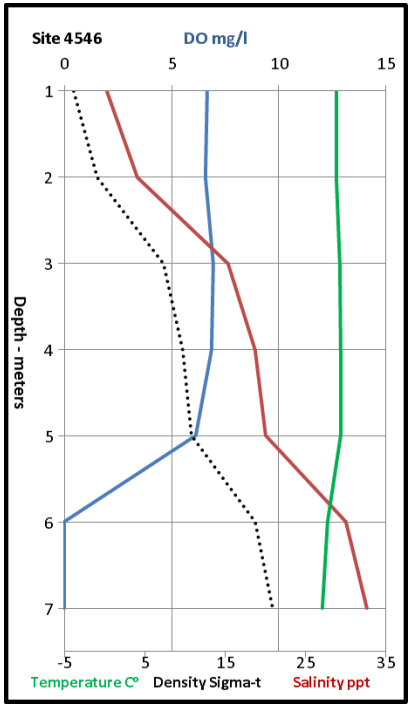


Figure 3.2.7. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Terrebonne Coastal subsegment (LA120806_00) on August 14, 2015. Not supporting DO with 18.9% below 5.0 mg/L criterion.

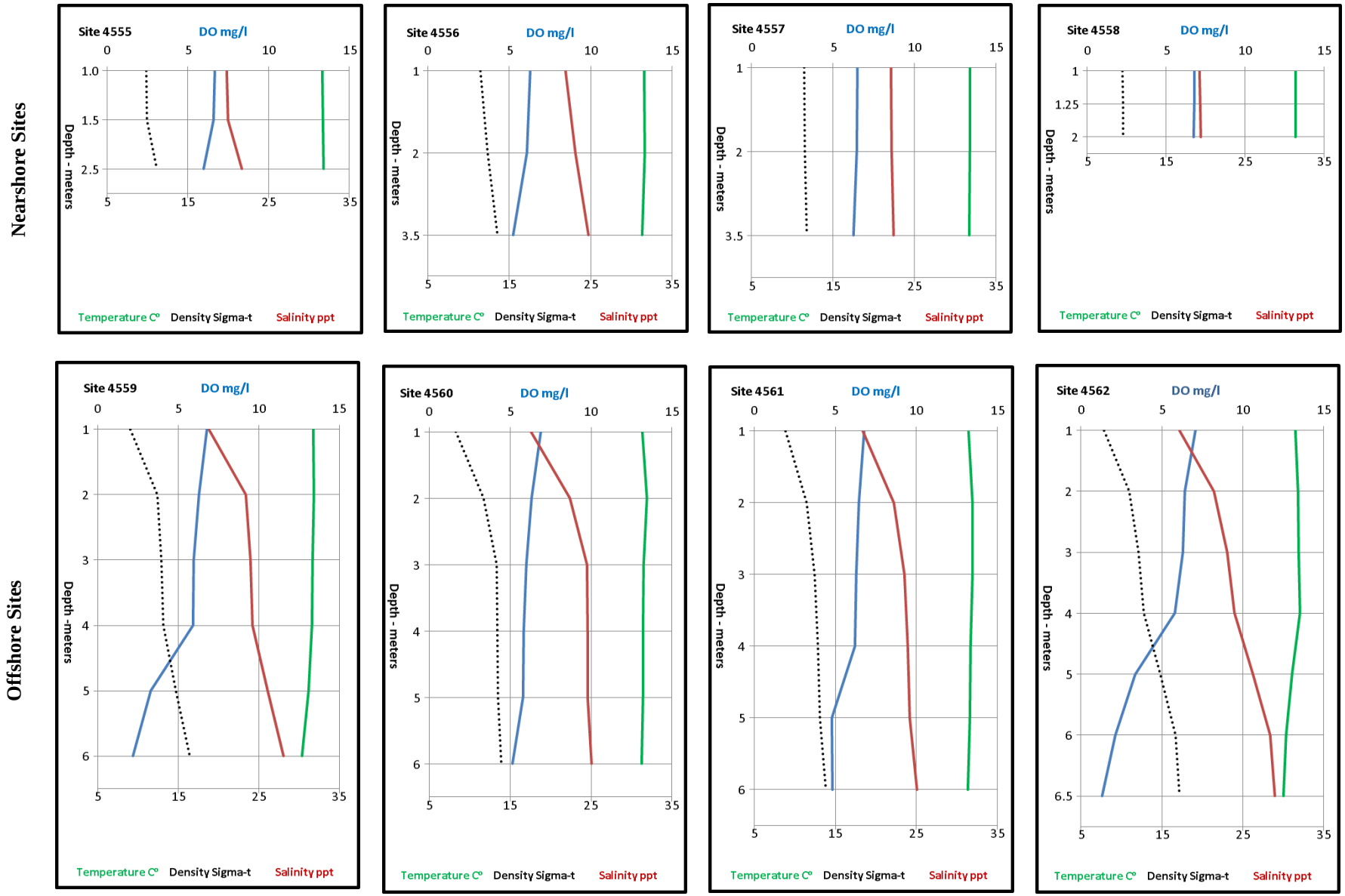
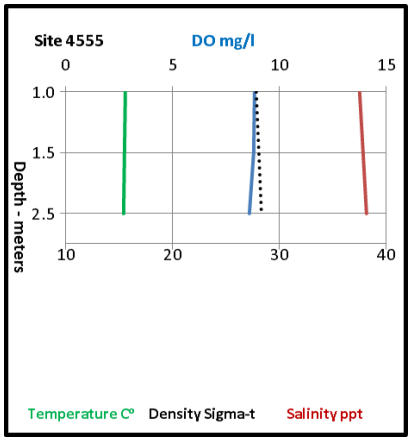
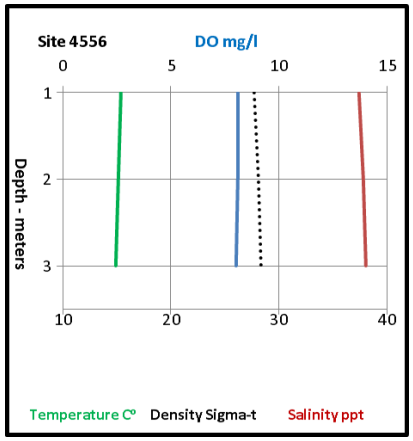
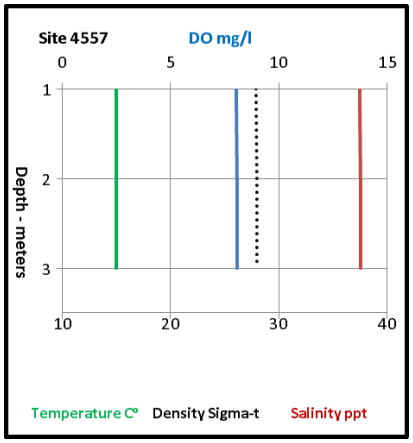


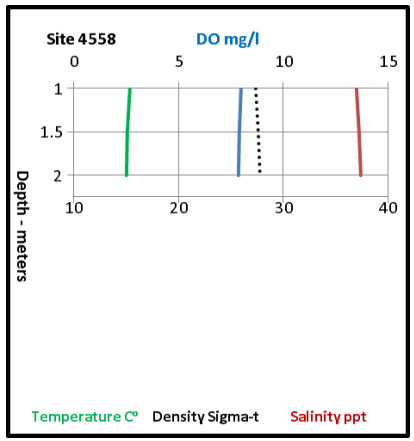
Figure 3.2.8. Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Terrebonne Coastal subsegment (LA120806_00) on March 2, 2015. Fully supporting DO with 0.0% below 5.0 mg/L criterion.

Nearshore Sites

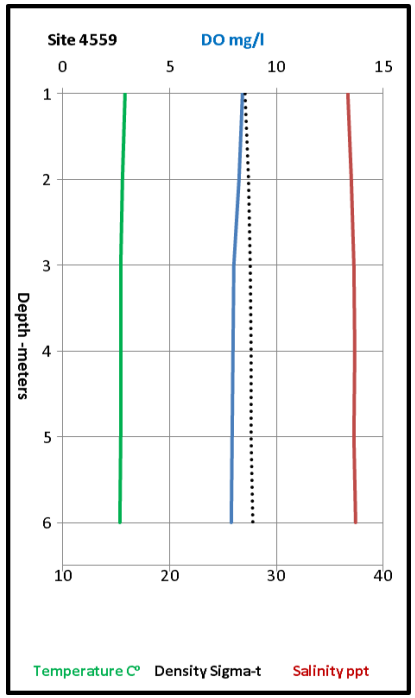


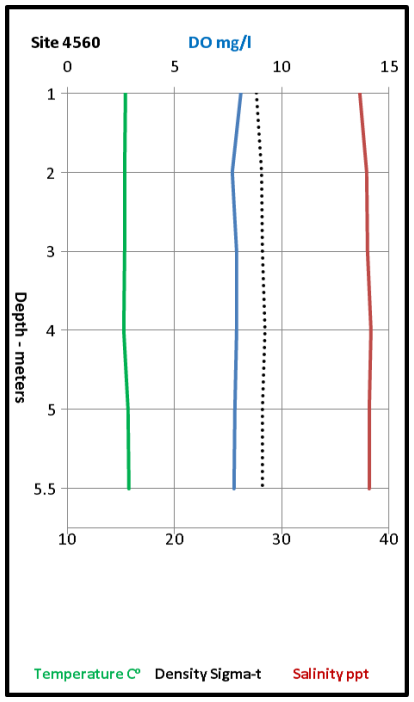


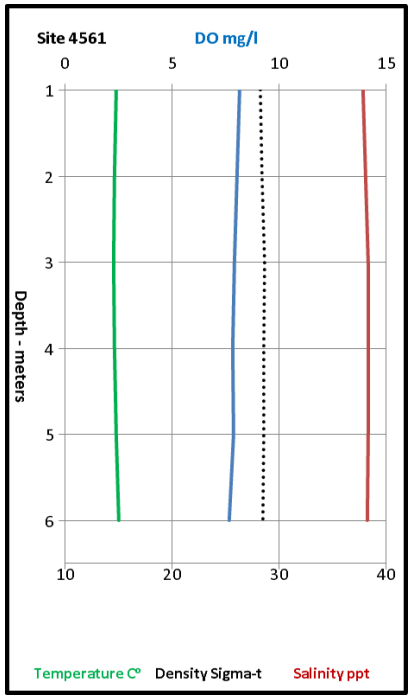


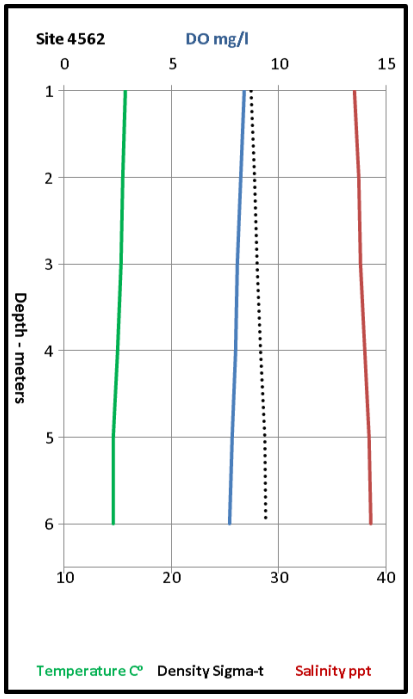


Offshore Sites









Use of Flow Rating for Assessments

As part of its ambient water quality monitoring program LDEQ includes a qualitative flow rating, which is recorded at the time water quality samples and meter readings are collected. LDEQ's flow ratings are found in Table 3.2.8. For the 2016 IR flow ratings of "no flow" were identified and evaluated to determine if the "no flow" rating may have impacted the water quality samples used for the report. "No flow" was reported for 166 samples at 50 sites. After reviewing the sites in question it was determined that low or no flow conditions are a common occurence for all of the streams. Therefore, no water quality data was rejected for use in the 2016 IR.

Table 3.2.8.

Flow severity ratings for suitable streams in Louisiana's ambient water quality monitoring network.

LDEQ Flow Code	LDEQ Flow Description
0 = Not Applicable	Used for lakes, estuaries, bays with no normal flow or only tidal flows.
1 = Dry	Streambed is completely dry with no visible pools.
2 = Intermittent	Streambed has water visible in naturally occurring isolated pools.
3 = No Flow	Streambed has water from bank to bank but flow is not detectable.
4 = Low Flow	Flows are detectable.
5 = Normal Flow	Flows greater than low flow but stay within the stream channel.
6 = High Flow	Flows that leave the normal stream channel but stay within the stream banks.
7 = Flood	Flows that leave the normal confines of the stream channel and move out on to the flood plain over the stream bank (either side of the stream).

Suspected Sources of Impairment

In addition to the use of water quality data in making assessments, LDEQ, OEC, ID staff familiar with local watershed conditions and activities provide input regarding significant suspected sources of impairment. Inspection Division staff also provide input in cases where natural sources were potentially causing criteria exceedances. In such cases, LDEQ will evaluate the need for a UAA or other water quality survey for potential criteria revision. Suspected sources for all water body impairment combinations are not required at this stage of IR development but will be provided in the final 2016 Integrated Report.

Integrated Report Category Determination

LDEQ made a preliminary determination of IR categorization (Table 3.2.1) based on statistical assessment of criteria exceedances and subsequent determination of a water body's designated use support (Table 3.2.2). LDEQ used additional information such as previous TMDL development (IRC 4a), insufficient data determinations (IRC 3), environmental events (e.g., droughts, severe weather, oil spill) (IRC 3 or 4b), remediation activities (IRC 4b), and suspected sources of impairment to determine appropriate IR categories. Multiple IR categories may be assigned to a single subsegment which has multiple criteria for multiple uses.

IR Category 3 was used for subsegments with potential nutrient enrichment concerns. Listings for nitrate/nitrite nitrogen and total phosphorus were historically based on evaluative assessments. However, the evaluative assessments were based on best professional judgment with no numeric nutrient criteria basis. LDEQ is currently coordinating with USEPA to collect data that will inform the nutrient criteria development process and allow more appropriate assessments in the future.

Total Maximum Daily Load Prioritization

The CWA Section 303(d) Program provides a mechanism for integration of implementation efforts to restore and protect the nation's aquatic resources. Through this process the nation's waters are assessed, restoration and protection objectives are systematically prioritized, and TMDLs and alternative approaches are adaptively implemented to achieve water quality goals with collaboration of State and Federal agencies, tribes, the regulated community, and the public. A new long-term vision has been described whereby states may identify and prioritize water bodies for these restoration and protection efforts under the 303(d) Program (Environmental Law Institute (ELI) 2014a, 2014b; USEPA 2013). The primary goals of this new long-term vision include prioritization, assessment, protection, alternatives, engagement, and integration.

This long-term vision requires that states establish a prioritization framework by which the states will establish a list of priority watersheds to be addressed during the period FY2016-FY2022. LDEQ developed such a framework and solicited public feedback. The comment period ended May 1, 2015. Comments received were considered during the development of the final list of priority watersheds. The prioritization framework was made available to the public via LDEQ's website at:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/CWA303dVisionProgram.aspx.
Electronic notices were sent out via Louisiana's electronic notification system.

In addition to conducting a public review of the prioritization framework, LDEQ delivered presentations at various conferences and workshops to inform stakeholders and the public. LDEQ also met with various state agencies, local governments, and watershed-based organizations. LDEQ commits to continuing engagement with stakeholders and the general public as it investigates and develops watershed protection and/or restoration plans in the priority watersheds. The resulting list of priority watersheds is listed below in Table 3.2.9.

Table 3.2.9.

List of priority watersheds for the period FY2016 – FY2022.

Projected Completion Year	Subsegment	Waterbody Name	Projected Plan Type	Target Percentage
2016	LA070505_00	Tunica Bayou – from headwaters to Mississippi River	TMDL Alternative	6
2017	LA070501_00	Bayou Sara – from Mississippi state line to Mississippi River	TMDL Alternative	25
2018	LA080905_00	Turkey Creek – from headwaters to Turkey Creek Cutoff; includes Turkey Creek Cutoff, Big Creek, and Glade Slough	TMDL Alternative	37
2019	LA040504_00	Yellow Water River – from headwaters to Ponchatoula Creek	TMDL Alternative	39
2020	LA040503_00	Natalbany River – from headwaters to Tickfaw River	TMDL Alternative	57
2021	LA040403_00; LA040401_00	Blind River - from headwaters to Amite River Diversion Canal; Blind River – from Amite River Diversion Canal to mouth at Lake Maurepas	TMDL Alternative	87
2022	LA040404_00	New River – from headwaters to New River Canal	TMDL Alternative	100

LDEQ expects that alternative plans are the most appropriate means to achieve the water quality standards since the impairment issues are likely caused by conditions outside the regulatory impacts of traditional TMDLs. Such conditions may include nonpoint source loads (including individual treatment units in unsewered areas), unpermitted dischargers, or permitted dischargers that are not meeting the limits provided in the current permit limits.

LDEQ anticipates that, in general, the alternative plans may include the tasks listed below. The actual plans may vary on a case-by-case basis based on the conditions and characteristics of the individual water body.

General Alternative Plan Structure

1. Investigative activities
    a. Water body monitoring
    b. Discharger inventory review
    c. Loading estimations (as needed based on the appropriate available data)
    d. Facility inspections
    e. Individual unit inspections
    f. Work with local stakeholders, governments, & organizations
        i. Education and outreach

    g. Pre-plan monitoring
2. Plan development
3. Implementation
    a. Assist local stakeholders, governments, & organizations
        i. Education and outreach
        ii. Development of ordinances as needed
        iii. Regionalization
    b. Implementation of BMPs
    c. Assist with required upgrades for
        i. Permitted
        ii. Unpermitted facilities (acquire permits)
        iii. Individual homes
    d. Compliance schedules/orders, penalties (as needed)
    e. Monitoring during implementation
4. Post-plan implementation monitoring

LDEQ has identified several potential partners to assist in activities conducted in the priority watersheds, including but not limited to:

1. United States Environmental Protection Agency (USEPA);
2. United States Geological Survey (USGS);
3. the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS);
4. the Louisiana Department of Health and Hospitals (LDHH);
5. the Louisiana Department of Agriculture and Forestry (LDAF);
6. the Louisiana Department of Wildlife and Fisheries (LDWF);
7. the Louisiana Department of Natural Resources (LDNR);
8. the Coastal Protection and Restoration Authority (CPRA);
9. the Lake Pontchartrain Basin Foundation (LPBF);
10. the Louisiana Conference;
11. local governments;
12. local watershed-based organizations; and
13. local watershed coordinators currently under LDEQ contract.

Funding is expected to be provided by various sources. The primary sources are expected to be performance partnership grants, 106 grants (pollution control), 319 grants (nonpoint source management), and the State Revolving Loan Fund. Additional funding may be provided by partnering agencies and organizations. Monitoring will be conducted to evaluate the progress of each individual plan. Ambient monitoring may serve as the primary source of monitoring, with additional monitoring conducted as needed. Plans will be adaptively managed to allow for necessary updates or changes in conditions. Plans will also be reviewed periodically to determine if the activities are being effective or if changes are needed and ensure that activities are being conducted appropriately.

All water body impairment combinations in IRCs 5 or IRC 5RC and not previously identified under the 303(d) Vision protocols were prioritized as follows.

- WICs listed in IRC 5 with drinking water source or oyster propagation designated uses with suspected impairments due to fecal coliforms or organic compounds were given medium priority.
- WICs listed in IRC 5 with suspected impairments due to fecal coliforms or organic compounds in subsegments *without* drinking water source or oyster propagation designated uses were assigned low priority for TMDL development.
- WICs listed in IRC 5RC were assigned low priority for TMDL development to allow LDEQ time to evaluate the need for updated criteria.
- WICs listed in IRC 5 based on LDHH beach monitoring data for enterococci bacteria impairments were assigned low priority to allow LDEQ time to coordinate with USEPA on source and epidemiological studies.
- WICs listed in IRC 5 for the following suspected impairments were assigned low priority due to the non-critical nature of the impairments or due to uncertainty regarding the validity of the suspected impairment (e.g., natural conditions, lack of apparent anthropogenic sources, sources outside the scope of TMDL development):
    - Low or high pH
    - Metals
    - Chlorides, sulfates, total dissolved solids
    - Temperature
    - Turbidity
    - Mercury in fish tissue (primary source is regional/global atmospheric deposition)
- All other WICs not previously mentioned were assigned low priority.

Summary

The 2016 IR §303(d) list represents a compilation of primarily four different sources of information: (1) the 2014 IR; (2) new data assessments for all 12 Louisiana basins with monitoring data (internal and external) between October 2011 and September 2015; (3) all recent TMDL activities occurring during or after development of the 2014 §303(d) list; and (4) current fish consumption and swimming advisories in Louisiana. It is important to note that removal of a water body from the §303(d) list, for any reason, does not remove water quality protections from that water body. All water bodies in Louisiana, listed or not listed, are subject to the same protections under federal and state laws and regulations, in particular the CWA and Louisiana's surface water quality standards (LAC 33:IX.Chapter 11). LDEQ will continue to monitor and assess the quality of Louisiana's waters; permitted facilities are subject to conditions of their permits; unpermitted point source dischargers are required to obtain a permit or face enforcement actions; violators of permit conditions are subject to enforcement action; and contributors to nonpoint sources of pollution are encouraged to follow BMPs as developed by LDEQ's Nonpoint Source Program and its many collaborators.

Integrated Report Category 4b Documentation

Introduction

Integrated Report Category 4b (Table 3.2.1) was used for water body impairment combinations (WICs) where a TMDL is not required or appropriate as a corrective mechanism for improving water quality. USEPA requires well documented justification for placement of a WIC in IRC 4b. The following sections outline the water bodies and subsegments categorized as IRC 4b and information to address EPA's six factors to provide sufficient documentation to place in 4b (USEPA 2002, USEPA 2005, USEPA 2006).

Bayou Bonfouca, Subsegments LA040907_00 and LA040908_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Bayou Bonfouca (subsegments LA040907_00, Hydrological Unit Code (HUC) 08090201 and LA040908_00, HUC 08090201) is a navigable waterway in St. Tammany Parish in southeastern Louisiana. It flows south for seven miles into Lake Pontchartrain.

Impairment and pollutant causing impairment

Bayou Bonfouca is listed in Louisiana's 2016 Water Quality IR as not fully supporting the primary contact recreation designated use as a result of suspected benzo(a)pyrene (PAHs) impairments. In 1987, LDHH and LDEQ issued an advisory against swimming in and consumption of fish from Bayou Bonfouca (revised 1998). Bayou Bonfouca is currently under an informational health advisory for no swimming or sediment contact (see (http://www.deq.louisiana.gov/portal/Portals/0/planning/Advisories/Fish%20Consumption%20Advisory%20Table%20-%202-17-16.pdf
and also
http://dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/CHEM_ADVISORIES_8_10_15.pdf)

Sources of pollutant causing impairment

In 1970, several thousand cubic yards of creosote spilled into Bayou Bonfouca and onto an adjacent land area following a fire and tank explosion at the American Creosote Works plant. The creosote plant had been operating for almost 100 years prior to its closure after the fire. The site is within the designated 100-year flood plain of the bayou. Legacy contamination is summarized at:
http://www.epa.gov/region6/6sf/pdffiles/bayou-bonfuca-la.pdf.

In 1976, the U.S. Coast Guard undertook an investigation of the Bayou Bonfouca waterway. This was supplemented by another study in 1978 by USEPA, the Coast Guard, and NOAA. Principal pollutants found at the site were creosote compounds, chemicals composed mostly of PAHs and commonly used as wood preservatives.

Bayou Bonfouca received final placement on the USEPA Superfund National Priorities List (NPL) in 1983 as a result of contamination by creosote. The NPL is a list of hazardous waste sites eligible for investigation and cleanup under the federal Superfund Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. Approximately 1.5 miles of Bayou Bonfouca were left biologically sterile due to severe creosote contamination. The Bayou Bonfouca Superfund site, located in Slidell, Louisiana on

the north shore of Lake Pontchartrain, includes the former American Creosote Works Plant and a portion of Bayou Bonfouca. Bayou Bonfouca forms the southern boundary of the site. Subsegments LA040907_00 and LA040908_00 were on the 1998 and 1999 court-ordered 303(d) lists and subsequently on the 2002 Consent Decree 303(d) List for priority organics and other impairments.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

Since impairment of Bayou Bonfouca is based on an informational health advisory issued by LDHH for no swimming or sediment contact, the water quality target will be achieved when the informational health advisory is rescinded.

Controls that will achieve Water Quality Standards

Beginning in January 1996, USEPA and LDEQ initiated work to correct the contamination at the Bayou Bonfouca Superfund site, including Bayou Bonfouca, under provisions of the federal Superfund program. USEPA and LDEQ jointly provided funds for cleanup of the site, with USEPA as lead agency in charge of remediation. Remediation of the abandoned facility involved the dredging of over 170,000 cubic yards of contaminated sediments from Bayou Bonfouca and removal of 8,000 cubic yards of surface waste materials. The selected remediation and disposal methods for the contaminated site included: excavation; capping the site; incineration of creosote waste piles and heavily contaminated bayou sediment; and pumping, treating, and monitoring contaminated groundwater. A design phase for groundwater remediation was completed in October 1989, and the *in situ* operation began in mid-1991. In November 1993, a cleanup contractor moved an incinerator to the site and completed a trial burn. In early 1994, excavation and incineration of the contaminated sediments was initiated. The ash was placed under a Resource Conservation and Recovery Act (RCRA) landfill cap onsite, and incineration was completed in the summer of 1995. No further surface water remediation is expected.

The second phase of remediation addresses dense nonaqueous phase liquids (DNAPLs) in the surficial aquifer. A statutory Five-Year Review Report of groundwater cleanup activity was completed in September 1996 (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3513215&ob=yes&child=yes).

Recommendations included continued groundwater recovery and treatment and an evaluation of treatment performance. In September 1997, USEPA made modifications in the groundwater recovery and treatment process to protect the integrity of the Source Control remedy based on a Performance Evaluation Report. In the spring of 2000, additional groundwater remedial activity began, and additional groundwater recovery wells were installed.

Descriptions of requirements under which pollution controls will be implemented

A Record of Decision (ROD) signed in March 1987 outlined a selected remediation plan for the Bayou Bonfouca Superfund site including bayou dredging, onsite incineration, and groundwater treatment. In June 1988, it was discovered that the extent and depth of the contamination was greater than previously estimated. The original ROD was amended under the "February 1990 Explanation of Significant Difference" (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=542710&ob=yes&child=yes).

On July 10, 2001, a second Five-Year Review Report was signed by USEPA (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3513177&ob=yes&child=yes), and LDEQ took over operations and maintenance at the site. As of December 2015, the Bayou Bonfouca site was in the continuing Operation and Maintenance phase of remediation. Under this phase, groundwater pumping and monitoring will continue for the foreseeable future.

Remediation activity documents are available in LDEQ's EDMS, including:

- Final Operation and Maintenance Plan Bayou Bonfouca Superfund Site, Slidell, Louisiana: http://www.deq.louisiana.gov/portal/Portals/0/remediation/Bayou-Bonfouca-Op-Maint-Plan.pdf
- Document ID 1496071 – Final Operation and Maintenance Addendum Bayou Bonfouca Superfund Site, Slidell, Louisiana: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=1496071&ob=yes&child=yes
- Document ID 2186669 – Final Field Sampling Plan: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=2186669&ob=yes&child=yes
- Document ID 671442 – Final Design: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=671442&ob=yes&child=yes
- Document ID 2186671 – Final Contractor Quality Control Plan: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=2186671&ob=yes&child=yes
- Document ID 9027498 – Quality Assurance Project Plan for Operations and Maintenance: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9027498&ob=yes&child=yes

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

Between January 2001 and April 2011, LDEQ conducted routine ambient water quality sampling on Bayou Bonfouca at site 0301 in Slidell (approximately one mile downstream from the remediation area) and site 1078 (approximately 4.4 miles downstream from the remediation area). During this sample period, 31 organic compounds were analyzed resulting in 638 analytical results. Of these samples, only six results were above detection levels. The parameters detected included chloromethane (two detections), toluene (one detection), and methylene chloride (three detections). None of the detections exceeded LDEQ's water quality criteria. All other results were at or below detection levels.

In addition, a review of USEPA's online Superfund Information System found that none of the contaminants in question were reported to be of concern in surface water or terrestrial areas of the Bayou Bonfouca site. The next five-year review of the site is scheduled for September 2016. For more information see https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0600574.

4) Schedule for Implementing Pollution Controls

As of December 2015, the Bayou Bonfouca site was in the continuing Operation and Maintenance phase of remediation. USEPA and LDEQ continue to review the operation and maintenance of the groundwater pumping and treatment of creosote oil. Under this phase, groundwater pumping and monitoring will continue for the foreseeable future. The groundwater treatment continues to reduce the volume of contaminated groundwater and prevent migration.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Monthly operational reports are submitted to USEPA for review and comment (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998245&ob=yes&child=yes for the latest monthly report—September 2015). LDEQ will continue routine surface water quality monitoring of Bayou Bonfouca to ensure protectiveness of remedial actions.

6) Commitment to Revise Pollution Controls, As Necessary

LDEQ Water Quality Program is committed to continuing ambient water quality monitoring as part of the routine monitoring program. In addition, LDEQ Remediation Services is committed to the continuing Operation and Maintenance phase of remediation as outlined in the July 2011 Five-Year Review Report (see http://www.epa.gov/superfund/sites/fiveyear/f2011060004128.pdf). The fifth five year review is scheduled to be completed in 2016.

Bayou Olsen/Olsen Bayou, Subsegment LA030304_001

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Bayou Olsen/Olsen Bayou (subsegment LA030304_001, HUC 08080206), is located in southwestern Louisiana and is located within the zone of tidal influence of the Gulf of Mexico. Bayou Olsen is approximately 0.5 mile long and lies within a larger water quality subsegment, Moss Lake (subsegment LA030304_00, HUC 08080206). Bayou Olsen is a tributary of Moss Lake.

Impairment and pollutant causing impairment

Bayou Olsen LA030304_001 is listed as impaired in Louisiana's 2016 Water Quality IR based on an LDEQ and LDHH swimming advisory limiting primary contact recreation. Bayou Olsen is listed as not fully supporting the Primary Contact Recreation and Fish and Wildlife Propagation designated uses as a result of 1,1,2-trichloroethane, 1,2-dichloroethane, and chloroform. In 1989, LDEQ and LDHH issued an advisory against sediment contact and for fish/shellfish consumption limits (reviewed 1994). (see http://www.deq.louisiana.gov/portal/Portals/0/planning/Advisories/Fish%20Consumption%20Advisory%20Table%20-%202-17-16.pdf
and also
http://dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/CHEM_ADVISORIES_8_10_15.pdf)

Sources of pollutant causing impairment

Adjacent to Bayou Olsen is the Carlyss Pit Remediation Site. The site was owned and operated by an independent disposal company from the late 1950s to 1971. During that time, waste materials, primarily liquid chlorinated hydrocarbons (LCH), were taken to the site and burned. Burning operations were subsequently discontinued, and the site was used for disposal of liquid wastes in surface impoundments or "ponds." In the past, Bayou Olsen received overflow from the waste ponds, which are located east of Highway 27 and 8.5 miles south of Sulphur, Louisiana.

VOCs were detected in Bayou Olsen sediments adjacent to the Carlyss Pit site. However, 2006 baseline surface water monitoring of Bayou Olsen implemented according to the LDEQ-approved Remedial Project Plan (RPP) for this site failed to demonstrate detectable levels of VOCs in the water column. Sampling was repeated in 2013 as described in *Bayou Sediments Area of Interest (AOI) Monitoring Report for 2013 Carlyss Pit #1 Site, Carlyss, Louisiana AI #7836* (Geosyntec, January 15, 2014 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9161181&ob=yes&child=yes). These data support the continued absence of site-related surface water impacts to Bayou Olsen from cross-media transfer of VOCs from the sediments.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For the primary contact recreation designated use, LAC 33:IX:1113.C.Table 1 specifies a 1,1,2-trichloroethane criterion of 6.9 µg/L for non-drinking water supply and a 1,2-dichloroethane criterion of 6.8 µg/L for non-drinking water supply.

For chloroform, LAC 33:IX:1113.C.Table 1 specifies a criterion of 70 µg/L for non-drinking water supply to protect for primary contact recreation.

For aquatic life protection, LAC 33:IX:1113.C.Table 1 specifies 1,1,2-trichloroethane criteria of 1,800 µg/L (acute) and 900 µg/L (chronic) for freshwater and brackish water; LAC 33:IX:1113.C.Table 1 specifies 1,2-dichloroethane criteria of 11,800 µg/L (acute) and 5,900 µg/L (chronic) for freshwater and 11,300 µg/L (acute) and 5,650 µg/L (chronic) for marine and brackish water.

For chloroform, LAC 33:IX:1113.C.Table 1 specifies criteria of 2,890 µg/L (acute) and 1,445 µg/L (chronic) for freshwater and brackish water and criteria of 8,150 µg/L (acute) and 4,075 µg/L (chronic) for marine water to protect aquatic life.

Water column results since at least 2006 have shown no detectable levels of VOCs in the Bayou Olsen water column; however, the advisory issued by LDHH remains in place. Additional sediment sampling and communication between LDEQ and LDHH will be required to lift the LDHH advisory and remove these compounds as suspected causes of impairment.

Controls that will achieve Water Quality Standards

Work began in June 1990 and was substantially completed by February 1992; approximately 1.5 million gallons of LCH were removed from the waste ponds. A Pond Closure Work Plan submitted to close the Carlyss Pit waste ponds was approved in May 1994. Work began in 1994 with the treatment of 6.9 million gallons of water from the Carlyss Pit waste ponds. Following water treatment, the waste ponds were filled with 185,000 cubic yards of clay and very low permeability soil. Subsequently the ponds were covered with clean topsoil, and vegetation was established. Natural attenuation of Bayou Olsen sediments was determined to be the best option for sequestration of remaining contaminants in the bayou. Reinforcement of the berm separating the former east pond from the bayou was completed in the fall of 2013.

Descriptions of requirements under which pollution controls will be implemented

An Interim Agreement was entered into by LDEQ on February 6, 1985 with Browning-Ferris Industries (BFI) and Conoco Inc. to perform work at the site. A preliminary Interim Remedial Action Plan was developed in August 1987 directing the companies to implement remedial activities, including removal of LCH from Bayou Olsen. In February 1990, BFI and Conoco, Inc. submitted the LCH Reclamation Work Plan, which was approved by LDEQ.

A Pond Closure Certification Report was submitted to LDEQ in October 1995. In February 1998, LDEQ indicated all companies had met all requirements for remediation of the site. (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=77580&ob=yes&child=yes)

LDEQ has approved a Monitored Natural Recovery as the remedy for the Bayou Sediments AOI. (LDEQ letter dated November 30, 2007 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=5985059&ob=yes&child=yes)

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

The Monitored Natural Recovery Remedy reduced potential ecological risks by allowing natural sedimentation to occur, thereby isolating the deeper sediments with higher concentrations of VOCs. Until data is available to indicate otherwise, LDEQ will continue to report this water body as impaired due to 1,1,2-trichlorethane, 1,2-dichloroethane, and chloroform. Future sampling data will be used to determine when the water body is fully supporting primary contact recreation uses.

4) Schedule for Implementing Pollution Controls

Remediation activities at the site have been completed.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Surface water monitoring is currently being implemented as described in the *Remedial Project Plan for Long-Term Monitoring of the Bayou Sediments AOI* (RPP, Geosyntec, March11, 2008) http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3412809&ob=yes&child=yes that was approved by LDEQ in a letter dated April 9, 2008 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3443861&ob=yes&child=yes.
In addition to annual site inspections, surface water sampling was initially planned biennially, subject to LDEQ-approved schedule modifications. Surface water sampling was conducted in the fall of 2015. The next bayou sampling event should be scheduled for 2017, since sampling is on a biennial schedule. According to the RPP of March 11, 2008, monitoring will be conducted until the remedial objectives for sediments have been attained and compliance with surface water quality standards demonstrated. Monitored Natural Attenuation continues to achieve protection of surface water and the area downstream of the former ponds, as the higher concentrations of site-related VOCs are remaining at depth and are overlain by cleaner accumulating sediment. Although sediment deposition appears to be occurring adjacent to the berm and the top six inches of sediment in this area meet the Remedial Criterion, it is recommended that potential alternatives be evaluated to increase the protectiveness of the remedy given the recent trend in sediment VOC concentrations at transect BL1. The Companies will develop a plan for additional bayou-related activities to

address this trend, including additional sampling as appropriate, and submit the plan to LDEQ by June 30, 2016.

Until such time as the impairment can be removed, IRC 4b remains the most suitable classification for the water body due to the known nature of the impairment and the ongoing remediation inspection actions described above. The remediation site continues to be inspected on an annual basis, and an Annual Corrective Action Plan (CAP) System Report is submitted to LDEQ. The most recent report is available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9577360&ob=yes&child=yes.

6) Commitment to Revise Pollution Controls, As Necessary

No further controls are expected to be needed. As stated in the March 11, 2008 RPP, if monitoring results indicate that the remedial objectives will not be met or that the site is causing adverse impacts to the designated water use, then the [responsible parties] will review the cause for this and the appropriateness of the Monitored Natural Recovery Remedy and may propose enhancements or changes to the remedy, if required. All modifications to the RPP will be subject to LDEQ approval before implementation.

Capitol Lake, Subsegment LA070503_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Capitol Lake (subsegment LA070503_00, HUC 08070201) is a small manmade lake formed between 1901 and 1908 when the lower reach of Grass Bayou was dammed approximately 0.25 mile east of the Mississippi River. The lake is located in downtown Baton Rouge adjacent to the State Capitol and the Governor's Mansion. It has a surface area of approximately 60 acres, and its depth varies from one foot in the northern arm to a maximum of eight feet in the southwestern arm. The average depth ranges between four and six feet. Capitol Lake drains an area of approximately 4.5 square miles, consisting primarily of residential, commercial and industrial land uses. The lake receives drainage from two unnamed canals, which are subsurface storm sewers in their upper reaches. At the southwest end of the lake, there is a pumping station, which is the only outlet for the lake. The East Baton Rouge City Parish government operates this pumping station. It is usually turned on only during storm events and discharges to the Mississippi River. Thus, Capitol Lake is a mostly stagnant system that is only flushed during storm events.

Impairment and pollutant causing impairment

Capitol Lake is listed in Louisiana's 2014 Water Quality IR as not fully supporting the fish and wildlife propagation use as a result of suspected impairment from PCBs. Capitol Lake is under a "no fish consumption" advisory issued by LDEQ and LDHH. (see http://www.deq.louisiana.gov/portal/Portals/0/planning/Advisories/Fish%20Consumption%20Advisory%20Table%20-%202-17-16.pdf
and also
http://dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/CHEM_ADVISORIES_8_10_15.pdf)

The advisory was initiated in 1983 due to the presence of PCBs in fish tissue, surface water, and sediments. (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=7386802&ob=yes&child=yes) The advisory was reviewed in 1994 and remained in effect. Additional information on Capitol Lake water quality can be found in LDEQ's EDMS at: http://www.deq.louisiana.gov/portal/tabid/2604/Default.aspx, AI#5040 and AI#91420.

Sources of pollutant causing impairment

Pollutant sources to Capitol Lake include both point and nonpoint sources, specifically, discharges, spills and urban stormwater runoff. Investigations were conducted in Capitol Lake by LDEQ's predecessor agencies in 1972, 1973, and 1981 for oil contamination. In 1981, Kansas City Southern Railroad was found to be a significant source of pollution. Later, enforcement actions against responsible industries were issued and corrective measures taken. However, oil and other pollutants continued to accumulate in the lake system, running off from urban surfaces such as streets, parking lots, gasoline stations, industrial and commercial facilities, and residences. In 1983, LDEQ's predecessor agency investigated a complaint concerning the discharge of oily wastes into the northern tributary of the lake system. The investigation revealed that oily wastewater, primarily from oil spillage and an underground storage tank leak, was draining into the canal from a Westinghouse Electric Corporation facility. Analysis of water samples revealed that PCBs were present in runoff water, canal water, and water from the center of the lake. PCBs were also found in fish tissue samples.

Investigation of other sources of pollution resulted in the issuance of enforcement actions and compliance orders requiring the cessation of discharge of oily waste or contaminated wastewater and control of discharges in excess of permit limits against Furlow-Laughlin Equipment Company Inc.; American Asphalt Corporation; City of Baton Rouge and Parish of East Baton Rouge; Comet Distribution Services Inc.; Kansas City Southern Railroad; and Road Runner Motor Re-builder Inc. It was also determined that none of the facilities were contributing PCBs. Other facilities that were possible sources of nonpoint PCB contaminated stormwater runoff from the storage of transformers, electric motors, and heavy equipment included the Louisiana Division of Administration Surplus Property Yard, U.S. Government Surplus Property Yard, and the Louisiana National Guard Armory, all located east of the lake.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For total PCBs, LAC 33:IX:1113.C.Table 1 specifies a freshwater chronic criterion of 0.0140 µg/L for aquatic life protection and a non-drinking water supply criterion of 5.61 x 10-5 µg/L to protect for primary and secondary contact recreation and fish consumption.

For PCBs in fish tissue, a final screening level of 270 µg/kg is suggested in Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants (May 2011).
http://www.deq.state.la.us/portal/Portals/0/planning/TSL%20and%20Documentation_FINAL_2011.pdf

Controls that will achieve Water Quality Standards

In 1985-86, Westinghouse complied with LDEQ's directive by removing PCB-contaminated soils from its property, installing a French drain system to contain groundwater contamination, and installing a stormwater culvert system through its property, allowing drainage canal stormwater to pass through without contacting PCB-contaminated soil.

Because concentrations of PCBs in the lake sediment are below the 50 ppm level required for designation as a hazardous waste site, Capitol Lake did not rank as a high priority for cleanup funding. Under the federal Superfund Program, this level of contamination is not considered an environmental emergency. Therefore, funding for cleanup has been from sources other than federal monies. Data indicate that the contaminated sediments do not pose a direct threat to the public or to area groundwater. However, the advisory on consumption of fish from the lake system remains in effect.

Descriptions of requirements under which pollution controls will be implemented

Analytical results confirmed that Westinghouse Electric Corporation was a major contributor of PCBs to the northern part of the lake. A compliance order was issued to Westinghouse Electric Corporation requiring the facility to stop all oil-contaminated discharges, to submit plans for evaluation of the extent of PCB contamination in surface and subsurface soils at and surrounding the property, and for the removal and/or containment of PCB contamination (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4007642&ob=yes&child=yes). Westinghouse Electric Corporation signed a settlement agreement with LDEQ establishing the framework and timetable for cleanup and containment of PCB contamination at the facility and establishing an automatic monetary penalty system if the company failed to fulfill any provision (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4007634&ob=yes&child=yes). Additional documents are available in LDEQ's EDMS, under AI#2056.

In 1988, the Louisiana Legislature created the Capitol Lake Task Force with the purpose of studying and making recommendations on how to preserve and enhance the qualities of Capitol Lake. This task force found that Capitol Lake was seriously contaminated and requested that the governor create a commission to begin implementing the long-term solutions proposed by the Task Force.

In February 1991, an additional report on the chemical contamination of Capitol Lake sediments was submitted to LDEQ, including the conclusion that there was no additional PCB contamination. Later in this same month LDEQ's Inactive and Abandoned Sites Division issued compliance orders against Kansas City Southern Railroad and Louisiana Oil and Re-refining Company, Inc. The compliance orders required these companies to submit to LDEQ a work plan for remedial investigation and feasibility studies and to begin execution of the work plans no later than 90 days after approval of the plans. In May 1991, the Kansas City Southern Railroad was also issued a compliance order by LDEQ for violating its water discharge permit. In June 1992, LDEQ issued a "cease and desist" order shutting down the Louisiana Oil and Re-refining Company; the owner pleaded guilty to federal charges of conspiracy to illegally discharge pollutants. The owner was sentenced to prison and fined.

In 1993, because of the presence of PCBs in the lake, LDEQ initiated an extensive survey of Capitol Lake with the objectives of: (1) determining whether any exposure risk existed for

people consuming fish from the lake system, (2) determining the extent and levels of contamination in the lake system, (3) determining any impacts upon the lake system's biological community, (4) confirming the extent and levels of contamination at the Westinghouse Electric Corporation facility, and (5) determining whether other sources of oil contamination were contributing PCBs to the lake system.

In January 1993, the governor signed an executive order creating the Governor's Commission on the Capitol Lake Rehabilitation Project and designated the LDEQ Secretary as chairman. LDEQ Office of the Secretary designed and conducted an environmental assessment of the Capitol Lakes system in 1997-1998. LDEQ collected and examined representative water, sediment, and fish tissue samples in sufficient quantity and quality to answer questions about human health risk posed by long-term exposure to toxic substances present in the lake system. The agency released a draft Risk Evaluation/Corrective Action Program (RECAP) risk assessment document in November 1998 that calculated and reported health risk. The health risk assessments included all possible pathways of human exposure to the constituents of concern at the concentrations found in the lake system's fish tissues and sediments. The RECAP risk assessment was amended, once in May 1999, and again in February 2000 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4985478&ob=yes&child=yes). Each revision responded to issues that were raised during the review of the draft RECAP risk assessment document. Through the risk assessment process for the lake system, LDEQ concluded that human health risks posed by exposure to the lake system, including consumption of edible fish, are within regulatory limits.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

In May 2002, LDEQ issued a statement of No Further Action, concluding that the Capitol Lakes system does not require any further management for protection of human health and environment. The June 17, 2002 decision documents are available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=1224436&ob=yes&child=yes. Capitol Lake will continue to be reported as impaired on the IR until the "no fish consumption" advisory has been lifted.

4) Schedule for Implementing Pollution Controls

LDEQ has determined that no further pollution controls are needed.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

LDEQ will continue to monitor Capitol Lake as part of the routine AWQMN. PCB sampling as part of the routine monitoring may take place as resources allow.

6) Commitment to Revise Pollution Controls, As Necessary

Based on the known nature of the suspected contamination and the LDEQ remediation decision reached on June 17, 2002, IRC 4b remains the most suitable classification for the 2016 Integrated Report. LDEQ will continue routine water quality monitoring of Capitol Lake as part of the AWQMN. New data will be used to reassess the water body in 2018. LDEQ will continue to work with LDHH to determine if and when the advisory can be removed.

Coastal Louisiana Partial Subsegments Impacted by 2010 Gulf of Mexico Oil Spill

(Six partial subsegments; see Table 3.2.5 for descriptions.)

1) Identification of Partial Subsegments and Statement of Problem Causing Impairment

Subsegment Description

The partial subsegments classified as IRC 4b make up a portion of the coast of southeastern Louisiana stretching from Terrebonne Parish to Plaquemine Parish (Table 3.2.5 and Figure 3.2.1 (boat above)). Southeastern coastal Louisiana consists of flat deltaic and coastal plains with freshwater and saline marshes. The partial subsegments affected encompass small portions of tidal channels, barrier islands, and a small number of islands within upper Barataria Bay.

Impairment and pollutant causing impairment

The partial subsegments shown in Table 3.2.5 and Figure 3.2.1 are listed in Louisiana's 2016 IR as not supporting the PCR designated use as a result of the suspected cause of *Residual Surface and Sub-surface Oil/Tar Balls/Tar Mats* due to ongoing indications of oiling. The six specific and limited portions of full subsegments identified are areas still found to have tar mats, or tar balls present.

Sources of pollutant causing impairment

On April 20, 2010, BP's Deepwater Horizon mobile drilling rig operating in the Gulf of Mexico approximately 50 miles off the Mississippi River Delta exploded and sank. This triggered a crude oil discharge from the damaged riser at the bottom of the Gulf that continued until August 4, 2010, when a static kill procedure effectively closed the well. The well was then cemented and permanently closed by September 19, 2010. The resulting oil spill affected a large portion of Louisiana's coastline. Carried by the tides and currents, oil reached the coast, polluting beaches, bays, estuaries and marshes from the Florida panhandle to west of the mouth of the Mississippi River, including the partial subsegments shown in Table 3.2.5 and Figure 3.2.1 (both above). Over a period of approximately three months, an estimated five million barrels (210 million gallons) of oil escaped from the well.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

From Louisiana's Environmental Regulatory Code LAC 33:IX.1113.B. 6: Free or floating oil or grease shall not be present in quantities large enough to interfere with the designated water uses, nor shall emulsified oils be present in quantities large enough to interfere with the designated uses (see http://www.deq.louisiana.gov/portal/tabid/1674/Default.aspx#Title33).

Controls that will achieve Water Quality Standards

Under the Oil Pollution Act of 1990 (OPA), the federal government and impacted state governments act as "trustees" on behalf of the general public. Trustees are responsible for an assessment of the nature and extent of natural resource injury. Trustees are also responsible for development and implementation of a plan or plans for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the injured natural resources and services those resources provide under their trusteeship (see

http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/phase-iii/). These plans are designed to return impacted areas to the condition they would have been in had the spill not occurred and compensate the public for associated interim loss of services.

Descriptions of requirements under which pollution controls will be implemented

As amended by the OPA of 1990, Section 311(d)1 of the CWA authorized the President to develop a National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP) to specify the federal response actions and authorities related to an oil spill (see https://www.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview). The CWA thus provides the President with the authority, in coordination with the states, to ensure that an oil spill is effectively removed and actions are taken to prevent further discharge from the source.
In addition, as described in the previous section, OPA provides for the restoration, rehabilitation, replacement, or acquisition of the equivalent of natural resources, and services those resources provide, that are injured by an oil spill, including associated interim loss of services.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

Removal, damage assessment, and remediation continue in the listed subsegments to address oil, dispersant, and other pollutants. As stated in the Natural Resource Damage Assessment (NRDA) *Deepwater Horizon Oil Spill Draft Phase I Early Restoration Plan and Environmental Assessment*, "While we do not yet know the extent of the natural resources that were impacted by the spill, we do know that the impacts were widespread and extensive and will take years to assess completely. The full spectrum of the impacts from this spill, given its magnitude, duration, depth and complexity, will be difficult to determine but the Trustees are working hard to assess every aspect of the injury, both to individual resources and lost recreational use of them, as well as the cumulative impacts of the spill. Affected natural resources include ecologically, recreationally, and commercially important species and their habitats across a wide swath of the coastal areas of Alabama, Florida, Louisiana, Mississippi, and Texas, and a huge area of open water in the Gulf of Mexico." (See http://www.gulfspillrestoration.noaa.gov/wp-content/uploads/2011/12/Final-ERP-121311-print-version-update-ES.pdf.)

4) Schedule for Implementing Pollution Controls

The damaged wellhead was permanently closed by September 19, 2010, although Louisiana has suffered recurring residual oiling since that time. Active coastal cleanup has been discontinued.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Coastal habitats may require years or decades to recover from oil exposure. Long-term monitoring of affected coastal habitats by federal and state agencies is anticipated in the aftermath of the Deepwater Horizon disaster, as part of the state's role as trustee of its natural resources. (See NOAA Phase III Early Restoration Plan.) Responsible agencies and universities may continue to locate and investigate residual surface and sub-surface oil/tar balls/tar mats.

6) Commitment to Revise Pollution Controls, As Necessary

If future ambient water quality data and information does not result in full or nearly full elimination of oil, dispersant, and other pollutant observations, LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations. In addition, long-term monitoring of the affected coastal habitat is expected as part of the NRDA restoration plans.

Devil's Swamp Lake and Bayou Baton Rouge, Subsegment LA070203_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Devil's Swamp Lake (subsegment LA070203_00, HUC 08070201) is a manmade lake near Scotlandville in East Baton Rouge Parish, Louisiana. The lake was created in 1973 by excavation of borrow for construction of levees at the Baton Rouge Barge Harbor. The oxbow-shaped lake, which has an approximate surface area of 24 acres, is in a large flood plain area north of the city of Baton Rouge. Devil's Swamp Lake is surrounded by low-lying bottomlands and receives drainage from the adjacent swamp, Devil's Swamp. The swamps to the north and south of the lake are characterized by numerous small open ponds and water tupelo trees; surface water flow in the swamp is generally from north to south. The 262-acre swamp to the north of the lake extends approximately one mile to Devil's Swamp Lake. The 684-acre swamp to the south of the lake extends approximately 2.2 miles to the east bank of the Mississippi River and is subject to frequent backwater encroachment from the river. The lake is approximately 0.75 mile in length, 400 feet wide, and 20 feet deep at its deepest parts. Devil's Swamp Lake also receives discharges and stormwater runoff from a hazardous waste facility northeast of the lake and from some industrial facilities, and it also receives floodwater from the Mississippi River during high flow periods. During flood conditions, the western and northern boundaries of the lake are indistinct because it coalesces with water of the surrounding swamp. Bayou Baton Rouge drains through Devil's Swamp and flows south into the Mississippi River upstream from the Baton Rouge Harbor Canal (see USGS report at http://pubs.usgs.gov/sir/2006/5301/pdf/sir2006-5301.pdf).

Impairment and pollutant causing impairment

Devil's Swamp Lake is listed in Louisiana's 2016 Water Quality IR as not fully supporting the fish and wildlife propagation due to the presence of unacceptable levels of PCBs and mercury in crawfish and finfish. The designated use of primary contact recreation remains impaired due to the possible presence of arsenic, HCB, HCBD, lead, and mercury in sediments.

Sources of pollutant causing impairment

Industrial facilities have discharged to the swamp surrounding Devil's Swamp Lake since the 1960s. Since 1980, repeated sampling of water, sediment, and fish tissue has demonstrated the presence of organic compounds, including PCBs, in Devil's Swamp Lake. Testing in March 1986 confirmed the presence of PCBs in lake sediments and the effluent channel used by Rollins Environmental Services (RES), now known as Clean Harbors Environmental Services. Following these analyses, both LDEQ and LDHH tested for toxic substance

residues in edible tissues of fish samples collected from the lake. The tissue analyses revealed PCB concentrations below the Food and Drug Administration (FDA) action level. However, concentrations of HCB and HCBD were found at levels above action levels protecting against long-term chronic exposure (see http://www.atsdr.cdc.gov/hac/pha/pha.asp?docid=729&pg=2#table10 Table 10).

In addition, high levels of lead, mercury, and arsenic were present. Following review of the analytical results, the state epidemiologist recommended issuance of an advisory against swimming in and consumption of fish from Devil's Swamp Lake. LDWF, LDHH, and LDEQ issued a joint advisory in October 1987. The agencies issued a revised health advisory that included the remainder of Devil's Swamp and Bayou Baton Rouge in June 1993. On August 12, 2015 the three agencies issued the most recent revision to the Devil's Swamp advisory. The revised advisory recommends no swimming or other primary contact water sports and no consumption of fish or crawfish from the area. The boundaries of this advisory may be adjusted in the future to reflect results of new information. The area of concern is bounded on the north by the former Hall-Buck Marine Road, on the east by the bluffs and the Baton Rouge Barge Harbor, and on the south and west by the Mississippi River. (see http://www.deq.louisiana.gov/portal/Portals/0/planning/Advisories/Fish%20Consumption%20Advisory%20Table%20-%202-17-16.pdf
and also
http://dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/CHEM_ADVISORIES_8_10_15.pdf)

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For arsenic, LAC 33:IX:1113.C.Table 1A specifies a criterion of 10.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for arsenic. The human health protection and drinking water supply criterion for arsenic is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For HCB, LAC 33:IX:1113.C.Table 1 specifies a criterion of 2.5×10^{-4} µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There are no freshwater acute and chronic aquatic life protection criteria for HCB.

For HCBD, LAC 33:IX:1113.C.Table 1 specifies a criterion of 0.11 µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. The non-drinking water supply criterion for HCBD is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For lead, LAC 33:IX:1113.C.Table 1A specifies a criterion of 50.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for lead. The aquatic life freshwater acute and chronic criteria are hardness dependent. Based on the lowest acceptable hardness value of 25 mg/L used in calculating

lead criteria values, the lowest possible chronic lead criterion for aquatic life protection is 0.54 µg/L.

For methylmercury in fish tissue, a final screening level of 230.0 µg/kg is suggested in *Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants* (May 2011) http://www.deq.state.la.us/portal/Portals/0/planning/TSL%20and%20Documentation_FINAL_2011.pdf.

For total PCBs, LAC 33:IX:1113.C.Table 1 specifies a criterion of 5.61×10^{-5} µg/L for non-drinking water supply and to protect for primary and secondary contact recreation and fish consumption. The human health protection and non-drinking water supply criterion for PCBs is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

Controls that will achieve Water Quality Standards

The land use and hydrology of the watershed is complex and is divided into five areas for investigational purposes:

- North and west of Petro-Processors (Petro-Processors is an NPL site located in the Devil's Lake watershed): This area has not been extensively studied; however, no contaminants associated with industrial activities have been detected at concentrations in excess of background levels in samples from this area. Based on hydrology and drainage patterns, it is unlikely that wastes from industrial activities affect the area.
- Immediately south to about 3,000 feet south of the former Hall-Buck Marine Road: Wastes released from pits during operation of the Petro-Processors NPL site extensively impacted the northeast corner of this area. This area has been extensively investigated and is being remediated under a 1984 Consent Decree. Four remedial processes have been applied. The most contaminated channel was excavated to the maximum depth that could safely be achieved. A second channel has been diverted and the original course filled with clean soil. The remaining less-contaminated sediments are being allowed to continue to naturally attenuate. The sediments are naturally anoxic enough that the chlorinated contaminants are being dechlorinated. The groundwater is also undergoing remediation by natural attenuation. This area also has an oxygen-reducing environment that allows natural dechlorination of the contaminants.
- Area bounded by the southern boundary of the area described in the preceding bullet and the northern end of Devil's Swamp Lake: There are scattered detections of chlorinated organics at concentrations that are well below levels that pose threats to the environment or human health.
- Devil's Swamp Lake: The lake and the swamp immediately adjacent have been shown to be contaminated by some of the chlorinated compounds present in the area described in the second bullet, above, and by PCBs. The probable source of these contaminants is the former RES site. USEPA is in the process of listing this site on the NPL. The state of Louisiana has agreed with this action.
- South Swamp: This is the area to the south and west of Devil's Swamp Lake that has not been impacted by either the RES site or the Petro-Processors site.

Descriptions of requirements under which pollution controls will be implemented

The Devil's Swamp Lake site was proposed for addition to the NPL in the Federal Register on March 8, 2004. USEPA completed evaluation and negotiations with some Potentially Responsible Parties (PRPs) and issued a Unilateral Administrative Order to PRPs to conduct a Remedial Investigation/Feasibility Study on December 3, 2009. As of December 2015 PRPs completed a Final Tier 2 Remedial Investigation Report that was made available to the public at the Scotlandville Branch of the East Baton Rouge Parish Library. For a history of site enforcement and cleanup actions, see USEPA ID LAD981155872, Devil's Swamp Lake at: http://www.epa.gov/region6/6sf/pdffiles/devils-swamp-la.pdf.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

Devil's Swamp Lake is currently under USEPA lead for the NPL. USEPA and LDEQ are working with the responsible parties to investigate the site; it is in the early stages of investigation (Remedial Investigation/Feasibility Study). Initial data has recently been collected and future data will be collected as the investigation proceeds. A fish consumption and swimming advisory remain in place for the area.

Based on AWQMN information and the arsenic criterion described above, LDEQ removed the arsenic impairment from Devil's Swamp Lake/Bayou Baton Rouge with the 2012 IR. Devil's Swamp Lake will continue to be reported as impaired for other WICs until the conclusion of all remediation actions and determination of full support.

Based on the well-established nature of the contamination issues and the ongoing NPL actions, IRC 4b remains the most suitable classification for this water body. Sampling data will be used to determine when the water body is fully supporting fish and wildlife propagation and primary contact recreation uses.

4) Schedule for Implementing Pollution Controls

This site is in the early stages of investigation. The Tier 1 Remedial Investigation Report containing the most recent collection of sample data and summaries for the site is available on LDEQ's EDMS under AI#86800, 2/10/12 (Electronic Document Management System http://www.deq.louisiana.gov/portal/tabid/2604/Default.aspx). A Tier 2 Remedial investigation was conducted to collect additional data to support findings in the Tier 1 report. This report is also available on LDEQ's EDMS under AI#86800, 10/31/2015 (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998159&ob=yes&child=yes).

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Monthly progress reports are submitted by Clean Harbors Environmental Services (formerly Rollins Environmental Services-RES) in accordance with the Administrative Order issued by LDEQ in 2003. See http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998159&ob=yes&child=yes for the latest monthly progress report of October, 2015. LDEQ will continue to monitor Devil's Swamp Lake and Bayou Baton Rouge as part of the routine AWQMN.

6) Commitment to Revise Pollution Controls, As Necessary

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations. LDEQ is also committed to working with responsible parties in determining appropriate remedial actions.

Sibley Lake, Subsegment LA101001_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Sibley Lake (subsegment LA101001_00, HUC 11140207) is a 2,250-acre freshwater impoundment located west of the city of Natchitoches in Natchitoches Parish, Louisiana. Sibley Lake is a manmade impoundment constructed in 1958 as a water supply and recreational lake for the City of Natchitoches and the surrounding area. The city's public water intake structure is located on the southeast side of the lake. Average lake depth is nine feet with maximum depths approaching 40 feet.

Impairment and pollutant causing impairment

Sibley Lake is listed in Louisiana's 2016 Water Quality IR as not fully supporting the fish and wildlife propagation use as a result of suspected PCB impairments. Based on the results of laboratory data, LDEQ and LDHH issued a joint advisory in February 1989 against the sale and consumption of fish taken from Sibley Lake. (Most recently reviewed in 2000.) (see http://www.deq.louisiana.gov/portal/Portals/0/planning/Advisories/Fish%20Consumption%20Advisory%20Table%20-%202-17-16.pdf
and also
http://dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/CHEM_ADVISORIES_8_10_15.pdf)

Sources of pollutant causing impairment

Since 1946, Tennessee Gas Pipeline Company (TGP) has operated a natural gas compressor station in the northwest corner of the uppermost major branch of the lake. TGP maintains three compressor buildings with 20 compressor engines which compress natural gas to be transported through a pipeline stretching from Texas to northern markets. In August 1988, TGP officials notified LDEQ that analysis of wastewater from one of its outfalls revealed the presence of PCBs. The concentrations found in the outfall wastewater are believed to have been present from residual amounts of PCBs at various locations in the facility resulting from the use of Pydraul, a lubricant containing PCBs, which was used at the facility from 1955 to 1968.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For total PCBs, LAC 33:IX:1113.C.Table 1 specifies a criterion of 5.59×10^{-5} µg/L for drinking water supply and to protect for primary and secondary contact recreation and fish consumption. The human health protection and non-drinking water supply criterion for PCBs is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

Controls that will achieve Water Quality Standards

TGP was ordered to cease discharge of wastewater containing PCBs. In addition, it was ordered to remediate the contaminated area. In November 1992, the contaminated sediment was excavated and removed from Sibley Lake and the area backfilled with clean soil. This

remediation was completed in January 1993. The excavated material was sent off-site for proper disposal.

Natural sedimentation is currently remediating Sibley Lake by depositing new sediments over older sediments that may still contain PCBs. As a result, PCBs have not been detected in Sibley Lake since 2000.

Descriptions of requirements under which pollution controls will be implemented

LDEQ issued a compliance order on September 1, 1988 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=7395597&ob=yes&child=yes) requiring TGP to sample lake sediments, fish tissue, effluent, and lake water and to take any and all measures necessary to cease discharge of wastewater containing PCBs. TGP was also required to submit a written report describing circumstances of cited violations of the discharge permit, remedial actions taken to mitigate any impacts resulting from violations, and actions taken to achieve compliance with the compliance order.

TGP ceased direct discharge of its wastewater and rerouted wastewater through an activated carbon treatment system prior to discharge into Sibley Lake. During 1989, TGP submitted the results of water, sediment and fish analyses to LDEQ for review. Results indicated non-detectable amounts of PCBs in water sampled throughout the lake. However, PCBs were found in lake sediment taken from the area around the TGP outfall and in fish taken from the area. PCB levels in some species of fish exceeded the FDA alert level of 2 ppm for Aroclor 1254. An April 11, 1989 compliance order authorized a long-term fish sampling program for Sibley Lake near Natchitoches, Louisiana (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4106142&ob=yes&child=yes).

A CERCLA Section 106 Administrative Order on Consent (CERCLA 06-07-90) pertaining to site investigation and source removal was negotiated with USEPA-Region 6 in November 1989 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4106141&ob=yes&child=yes).

In February 1990, TGP officials agreed to conduct a study of the sediment in a targeted area around the wastewater outfall to provide data for the development of an appropriate remediation plan. Based on results of the study, LDEQ requested that TGP submit a remedial action plan for the physical removal of PCBs at and adjacent to the discharge pipe in Sibley Lake. In June 1991, LDEQ issued a compliance order to TGP as a result of TGP's lack of response to requests for a remediation plan. The compliance order also specified an annual fish monitoring program and ordered the submittal of a remedial action plan (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4106139&ob=yes&child=yes). A request for a hearing was filed by TGP in July 1991, and in October 1991, TGP submitted a remedial action plan and alternative evaluation report for Sibley Lake.

In October 1992, LDEQ and TGP reached a settlement agreement. The settlement agreement set forth three phases of remediation: Phase I, obtaining permits to conduct remediation; Phase II, remediation of Sibley Lake; and Phase III, post-construction monitoring of fish and water, which was to commence upon LDEQ's acceptance of the completion of Phase II. The agreement required the installation of a rainwater control structure; the excavation of sediments from the lake near the facility's wastewater outfall; and the backfilling, grading and restoration of the excavated areas (see

http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3794297&ob=yes&child=yes).

Excavation and removal of sediments started in November 1992. Excavated material was sent off-site to a hazardous waste disposal site. After removal of the contaminated sediments, TGP backfilled the area with clean soil. In January 1993, TGP completed the excavation and backfilling required by the agreement.

The first set of monitoring data was collected from Sibley Lake in May 1994. The results of that data indicated that the level of PCBs in fish declined by more than 50% within the first three years after remediation. Although the remediation process was gradually reducing the bioavailability of PCBs, in June 1994 the advisory for Sibley Lake was reviewed and continued.

In January 1996, the advisory against the sale and consumption of fish from Sibley Lake was lifted. However, a new advisory was placed into effect at that time (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=7915223&ob=yes&child=yes). The new advisory recommends no consumption of gar, shad, and carp. For other species, within any one-month time period, eating fish from Sibley Lake should be limited to only one of the following two options: (1) one meal per week of largemouth bass or crappie; or (2) one meal per month of channel catfish, striped bass or other species (excluding gar, shad, and carp). All fish consumed should be skinned and trimmed of fat then broiled, grilled, or baked. These fish should not be fried because this traps the contaminants in the fish. A meal is considered 0.5 pound of fish for adults and children.

In March 1997, the CERCLA Administrative Order on Consent 06-07-90 was lifted (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4099844&ob=yes&child=yes) as a result of TGP's compliance with the terms of the Order.

The Administrative Order of October 14, 2011 requires TGP to perform fish tissue sampling and reporting every five years. Documentation of 2006 fish tissue monitoring is available in LDEQ's EDMS at
http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=6021197&ob=yes&child=yes,

Additional documents are available under AI#3144 on LDEQ's EDMS at
http://www.deq.louisiana.gov/portal/tabid/2604/Default.aspx.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

Despite improvements in water column and fish tissue results, Sibley Lake will continue to be reported as impaired due to PCBs until such time as the ongoing monitoring by the responsible party described above indicates the fish consumption advisory can be lifted. The decision to lift or modify the advisory will be made in conjunction with LDHH. IRC 4b remains the most suitable classification for the water body because of the known nature of the contamination in question and the ongoing activities described above.

4) Schedule for Implementing Pollution Controls

In November 1992, the contaminated sediment was excavated and removed from Sibley Lake and the area backfilled with clean soil. This remediation was completed in January 1993. The excavated material was sent off-site for proper disposal.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

The Sibley Lake project is in the Post Remediation Phase (including monitoring) and the lake is still under a fish consumption advisory due to PCBs. The purpose of the monitoring program at Sibley Lake is to document the success of the selected remediation measure. Natural sedimentation is currently remediating Sibley Lake by depositing new sediments over older sediments that may still contain PCBs. As a result, PCBs have not been detected in the water column in Sibley Lake since 2000. The most recently available fish tissue monitoring report (2006) indicated that PCBs were still present in fish; however, average concentrations for all eight target species were below FDA recommendations of 2.0 ppm.

TGP is mandated to perform fish tissue sampling and reporting every five years according to the Administrative Order of October 14, 2011 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=8149482&ob=yes&child=yes).

TGP monitors its discharge for PCBs quarterly as required by its 2015 LPDES water permit (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9625181&ob=yes&child=yes) and submits a monthly discharge monitoring report to LDEQ. LDEQ will continue to monitor Sibley Lake as part of the routine AWQMN. PCB sampling as part of the routine monitoring may take place as resources allow.

6) Commitment to Revise Pollution Controls, As Necessary

Based on the known nature of the suspected contamination, IRC 4b remains the most suitable classification for the 2014 IR. LDEQ will continue routine water quality monitoring of Sibley Lake as part of the AWQMN. New data will be used to reassess the water body in 2018. LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations. LDEQ is also committed to working with responsible parties in determining appropriate remedial actions.

Statewide Louisiana Subsegments Impacted by Non-Native Aquatic Plants

(Multiple subsegments and uses, see Table 3.2.10 for details.)

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Subsegments classified as Integrated Reporting Category (IRC) 4b with impairment caused by non-native aquatic plants are located throughout the state of Louisiana. The subsegments encompass rivers, lakes, bayous, tidal channels, and canals and occur in nine of Louisiana's twelve major river basins. Serving as a corridor between the continental United States and the subtropical world beyond the Gulf of Mexico, Louisiana has a humid, subtropical climate with abundant rainfall enabling rapid growth of vegetation. Average annual precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux. With over one million acres of freshwater lakes/reservoirs, over seven million acres of wetlands, and nearly 8,000 square miles of estuaries and bays at risk, a substantial portion of Louisiana is threatened by invasive aquatic plants (Table 3.2.10).

Table 3.2.10.

Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.

Subsegment Number	Subsegment Description	Water Body Type	Size[1]
LA010701_00	Bayou Teche-From Berwick to Wax Lake Outlet	River	14
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	River	53
LA020102_00	Bayou Boeuf, Halpin Canal, and Theriot Canal	River	19
LA020103_00	Lake Boeuf	Lake	6100
LA020201_00	Bayou Des Allemands-From Lac Des Allemands to old US-90 (Scenic)	River	7
LA020202_00	Lac Des Allemands	Lake	14720
LA020301_00	Bayou Des Allemands-From US-90 to Lake Salvador (Scenic)	River	14
LA020302_00	Bayou Gauche	River	4
LA020304_00	Lake Salvador	Lake	44800
LA020401_00	Bayou Lafourche-From Donaldsonville to ICWW at Larose	River	68
LA040401_00	Blind River-From Amite River Diversion Canal to mouth at Lake Maurepas (Scenic)	River	5
LA040403_00	Blind River-From headwaters to Amite River Diversion Canal (Scenic)	River	20
LA040404_00	New River-From headwaters to New River Canal	River	24
LA040602_00	Lake Maurepas	Estuary	91
LA060102_00	Cocodrie Lake	Lake	6,099
LA060203_00	Chicot Lake	Lake	1,626
LA070202_00	Raccourci Old River	Lake	4,160
LA080102_00	Bayou Chauvin-From headwaters to Ouachita River	River	6
LA100302_00	Black Bayou Lake-From LA-1 to spillway	Lake	3,968
LA100406_00	Flat River-From headwaters to Loggy Bayou	River	46
LA100502_00	Lake Bistineau	Lake	17,216
LA100603_00	Wallace Lake	Lake	9,248
LA100605_00	Clear Lake and Smithport Lake; includes old Edwards Lake	Lake	2,944
LA100702_00	Black Lake Bayou-From one mile north of Leatherman Creek to Black Lake (Scenic)	River	37
LA101302_00	Iatt Lake	Lake	7,104
LA110101_00	Toledo Bend Reservoir-From Texas-Louisiana state line to Toledo Bend Dam	Lake	181,760
LA120108_00	False River	Lake	2,912
LA120110_00	Bayou Cholpe-From headwaters to Bayou Choctaw	River	11

Table 3.2.10.

Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.

Subsegment Number	Subsegment Description	Water Body Type	Size[1]
LA120204_00	Lake Verret and Grassy Lake	Lake	14,080
LA120301_00	Bayou Terrebonne-From Thibodaux to ICWW in Houma	River	54
LA120404_00	Lake Penchant	Lake	832
LA120405_00	Lake Hache and Lake Theriot	Lake	1,594
LA120501_00	Bayou Grand Caillou-From Houma to Bayou Pelton	River	8
LA120503_00	Bayou Petit Caillou-From Bayou Terrebonne to LA-24 bridge	River	5
LA120504_00	Bayou Petit Caillou-From LA-24 bridge to Boudreaux Canal (Estuarine)	River	12
LA120505_00	Bayou Du Large-From Houma to Marmande Canal	River	7
LA120506_00	Bayou Du Large-From Marmande Canal to 1/2 mile north of St. Andrews Mission (Estuarine)	River	7
LA120507_00	Bayou Chauvin-From Ashland Canal to Lake Boudreaux (Estuarine)	River	8
LA120601_00	Bayou Terrebonne-From Houma to Company Canal (Estuarine)	River	8
LA120602_00	Bayou Terrebonne-From Company Canal to Humble Canal (Estuarine)	River	10
LA120604_00	Bayou Blue-From ICWW to Grand Bayou Canal	River	29
LA120605_00	Bayou Pointe Au Chien-From headwaters to St. Louis Canal	River	25
LA120606_00	Bayou Blue-From Grand Bayou Canal to Bully Camp Canal (Estuarine)	River	7
LA120703_00	Bayou Du Large-From 1/2 mile north of St. Andrews Mission to Caillou Bay (Estuarine)	River	22

[1] Size Units: River = miles; Lake = acres; Estuary = square miles

Impairment and pollutant causing impairment

Subsegments shown in Table 3.2.10 are listed in Louisiana's 2014 IR as not fully supporting the FWP designated use as a result of *non-native aquatic plants*. Non-native aquatic plants are included in the NPDES list of pollutants as "biological materials" (see http://cfpub.epa.gov/npdes/glossary.cfm#P). Invasive aquatic species are rapid colonizers and are competitively superior to most native plants, quickly dominating the aquatic plant community after introduction to a water body. Specific species of non-native aquatic plants were not reported by LDEQ staff making these impairment determinations. However, typical non-native aquatic plants of concern for the reported subsegments may include but are not

limited to water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), giant salvinia (*Salvinia molesta*), and common salvinia (*Salvinia minima*). Many of the following species may also be of concern in the subsegments reported as impaired. All species mentioned below will not be present in all subsegments. According to the *State Management Plan for Aquatic Invasive Species in Louisiana* (Tulane Univ. and Xavier Univ. 2005), the following aquatic plants are classified as "extensively established species" that occur in eight or more drainage basins in Louisiana:

- Water hyacinth – South American native; clogs waterways, impedes boat traffic, slows water currents and blocks light to submerged vegetation, thus lowering DO levels
- Parrot feather (*Myriophyllum aquaticum*) – South American native that can block waterways, preventing fishing and boat traffic and providing ideal mosquito breeding habitat
- Hydrilla – rooted aquatic weed from Asia forms thick mats which can impede boat traffic and swimming, and lower DO levels, killing fish
- Wild taro (*Colocasia esculenta*) – forms dense stands in riparian zones and displaces native vegetation
- Brazilian waterweed (*Egeria densa*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; chokes out native vegetation and degrades water quality and fish habitat
- Eurasian watermilfoil (*Myriophyllum spicatum*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; outcompetes native vegetation and degrades water quality for fish and birds
- Water lettuce (*Pistia stratiotes*) – believed to be native to Africa; impedes swimming, boating, and fishing; degrades water quality for native vegetation and adversely affects fish and bird populations
- Common salvinia – Central and South American native; forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds

The following aquatic plants are classified as "locally established species" that occur in three to seven Louisiana drainage basins:

- Giant salvinia – free-floating, rootless plant forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds; can double its biomass every seven to 10 days under ideal conditions; chokes waterways and has interfered with floodgate operation
- Cogon grass (*Imperata cylindrica*) (the Louisiana Aquatic Invasive Species (LAIS) taskforce classifies cogon grass as an aquatic invasive because it was introduced through an aquatic pathway and occurs in areas that experience some flooding; it spreads rapidly with a dense growth pattern that creates unsuitable habitat for native plants, insects, mammals, and birds.)

The following aquatic plants occur in fewer than three drainage basins in Louisiana and are classified as "potential arrivals":

- Purple loosestrife (*Lythrum salicaria*) – European native with prolific seed production; disrupts ecosystems by outcompeting native plants, diminishing habitat for fish and birds; clogs irrigation systems and destroys grazing pastures
- "Cylindro" (*Cylindrospermopsis raciborskii*) – an invasive, subtropical, microscopic species of blue-green algae; believed to have been introduced to Florida over 30 years ago and has spread rapidly across North America; highest concentrations below the water surface; produces neurotoxins and hepatotoxins; has caused deaths of humans and wildlife worldwide; outcompetes other algae and can cause public health impacts by its presence in drinking water reservoirs

The *State Management Plan for Aquatic Invasive Species in Louisiana* places Louisiana second only to Florida in number of introduced aquatic plant species, with 32 and 45, respectively.

Sources of pollutant causing impairment

The suspected source of impairment for these IRC 4b subsegments is *introduction of non-native organisms (accidental or intentional)*. Numerous sources state that the history of invasive aquatic plants in Louisiana started with the distribution of water hyacinth at the 1884 World's Industrial and Cotton Centennial Exposition in New Orleans (see http://www.lsuagcenter.com/en/communications/publications/agmag/Archive/2010/fall/Invasive-Aquatic-Weeds-in-Louisiana.htm). In this century, Louisiana is home to the busiest port system in the nation in terms of tonnage, offering ready access for invasive aquatic plants to enter state waters from bulk and containerized cargoes and through ballast discharge of ships. Other invasive plants were introduced to Louisiana through the aquarium trade, as a result of nursery sales, and, in the cases of Eurasian water milfoil and Brazilian water weed, possibly by federal authorities with beneficial intent. Many species are also transferred among water bodies on boats and boat trailers. Natural sources are also responsible for the spread of invasive aquatic plants, including wind, flooding, and animals, including birds.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

As stated in LAC 33:IX.1113.B.1, "The waters of the state shall be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualifications." (see http://www.deq.louisiana.gov/portal/tabid/1674/Default.aspx).
As set forth in LAC 33:IX.1113.B.12, "The biological and community structure and function in state waters shall be maintained, protected, and restored except where not attainable and feasible as defined in LAC 33:IX.1109. This is the ideal condition of the aquatic community inhabiting the unimpaired water bodies of a specified habitat and region as measured by community structure and function...Reference site conditions will represent naturally attainable conditions…This condition shall be determined by consistent sampling and reliable measures of selected, indicative communities of animals…and/or plants as established by the department…" The water quality target can be seen as the preservation and restoration of integrity to the native, balanced biological and aquatic community structure in Louisiana's aquatic ecosystems.

USEPA's NPDES vessels program regulates incidental discharges from the normal operation of vessels. The NPDES vessels program does not regulate discharges from military vessels or

recreational vessels. Instead, those are regulated by other USEPA programs under §312 of the Clean Water Act. Incidental discharges from the normal operation of vessels include, but are not limited to, ballast water, bilgewater, graywater (e.g., water from sinks, showers), and anti-foulant paints (and their leachate). These discharges may result in negative environmental impacts via the addition of traditional pollutants or, in some cases, by contributing to the spread of Aquatic Invasive Species
(see http://cfpub.epa.gov/npdes/home.cfm?program_id=350).

USEPA currently regulates vessel discharges with the Vessel General Permit (VGP). The current permit, the 2013 VGP is in effect until 2018. USEPA is proposing a draft 2013 VGP and Small Vessel General Permit (sVGP) to authorize discharges incidental to the normal discharge of operations of commercial vessels. This site is intended to answer many questions the commercial vessel owner/operator may have concerning the draft VGP and/or the sVGP. (see
https://www.epa.gov/sites/production/files/2013-12/documents/vesselgeneralpermit-erp.pdf).

Management actions described by the LAIS Task Force (see below), should, when implemented, decrease the rate of introduction of invasive aquatic plant species into Louisiana water bodies. It is doubtful that full eradication of invasive aquatic plants will be achieved in light of the numerous natural mechanisms of spread, such as wind, flooding, and birds that cannot be legislated or controlled.

Controls that will achieve Water Quality Standards

The LAIS Task Force convened by order of Governor M. J. Foster determined that "invasive species pose a serious threat to the economic and ecological health of the State of Louisiana" and produced the *State Management Plan for Aquatic Invasive Species in Louisiana* (see http://is.cbr.tulane.edu/docs_IS/Louisiana-AIS-Mgt-Plan.pdf). The plan describes the nature and extent of this environmental problem and proposes a coordinated suite of specific management actions to minimize negative impacts.

LAIS Task Force goal and objectives are as follows:

Goal: Prevent and control the introduction of new nonindigenous species into Louisiana, control the spread and impact of existing invasive species, and eradicate locally established invasive species wherever possible.

> Objective 1: Coordinate all aquatic invasive species management activities or programs within Louisiana and collaborate with regional, national, and international aquatic invasive species programs
>
> Objective 2: Prevent and control the introduction/reintroduction of nonindigenous invasive species through education about species and pathways, targeting the general public (including schools), industries, user groups, government agencies, and nongovernmental organizations (NGOs)
>
> Objective 3: Eliminate locally established invasive species through monitoring, early detection, rapid response, and early eradication
>
> Objective 4: Control the spread of established invasive species through cooperative management activities designed to minimize impacts when eradication is impossible

Objective 5: Prevent the introduction of non-native species, or the spread of existing ones, through legislation and regulation

The LAIS Task Force recommended these management actions:

- Hire staff to administer the LAIS Council and Advisory Task Force
- Develop a rapid Response and Early Eradication Plan
- Assess Louisiana ports and waterways for invasive species

Descriptions of requirements under which pollution controls will be implemented

Congress has been concerned about economic and ecological risks from non-native plants since at least 1912, when it passed the Plant Quarantine Act. More recently, Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA–see http://www.anstaskforce.gov/Documents/nanpca90.pdf). NANPCA was amended and expanded by the National Invasive Species Act of 1996 (NISA–see http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=104_cong_public_laws&docid=f:publ332.104.pdf) in order to prevent the spread of invasive species and to fund, manage, and disseminate information that will help control the impacts of invasive species. The National Invasive Species Council (NISC) was established by Executive Order 13112 to ensure that federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient (see http://www.invasivespecies.gov/).

Taking the mandates of the CWA into consideration, Congress passed the Clean Boating Act of 2008 (see http://water.epa.gov/lawsregs/lawsguidance/cwa/vessel/CBA/) directing USEPA to develop and promulgate management practices for recreational vessels to mitigate adverse effects from recreational boat discharges such as bilge water, graywater, and deck runoff that may spread invasive species.

The federal government has attempted to control introduction of invasive plant and animal species by requiring commercial shipping interests to submit a ballast water management plan. In March 2012, the Department of Homeland Security/U.S. Coast Guard published the Ballast Water Discharge Standard Rule, adding performance standards for discharges of ballast water (see http://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-6579.pdf).

In Louisiana, LDWF has jurisdiction over listed noxious aquatic plants. La. R.S. 56:328(B) prohibits anyone at any time from knowingly importing or causing the import of listed aquatic plant species or causing them to be transported into Louisiana from any other state or country without first obtaining a written permit from the Wildlife and Fisheries Commission (see http://www.legis.state.la.us/lss/lss.asp?doc=105222).

The LAIS Task Force was formed by authority of Louisiana Executive Order MJF 02-11 on June 4, 2002. In 2004 a bill passed both the Louisiana House and Senate and was signed into law by Governor Kathleen Blanco calling for the creation of the LAIS Council and Advisory Task Force to implement the LAIS management plan (RS 56:360.1 http://www.legis.state.la.us/lss/lss.asp?doc=285476; RS 56:360.2 http://www.legis.state.la.us/lss/lss.asp?doc=285477).

As noted above, the LDWF currently leads Louisiana's aquatic invasive species efforts. Its work includes spraying of water bodies overtaken by invasive species and periodic drawdowns of reservoirs to try and limit the spread. In addition, the agency has a public education component including a brochure and a website. See http://www.fishla.org/group/invasive-and-prohibited/ and http://www.wlf.louisiana.gov/fishing/waterbody-management-plans-inland for more information on LDWF invasive species programs.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

IRC 4b remains the most suitable classification for the listed subsegments because of the known nature of the impairment in question and the ongoing activities described above. Because invasive aquatic plants are spread by numerous pathways to and among water bodies and because legislation is pending to address some of these pathways, it is not yet possible to estimate when non-native aquatic plants will no longer be a concern.

4) Schedule for Implementing Pollution Controls

Non-native aquatic plant control activities are based on the LAIS Task Force management plan. Due to the nature of the impairment in question it is not possible to develop a reasonable schedule for implementation of pollution control activities.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

The LAIS Task Force, currently staffed only by LDWF personnel, is required to submit an annual status report on its aquatic invasive species management plan and its implementation every year to the state legislature. LDEQ will continue routine surface water quality monitoring of the listed subsegments as part of the AWQMN.

6) Commitment to Revise Pollution Controls, As Necessary

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations, including evaluation of non-native aquatic plant observations. Revisions to controls for non-native aquatic plants through the LDWF management plan and its implementation are required every year to the state legislature.

USEPA's National Coastal Conditions Assessment

Beginning in the early 2000s, USEPA began development of what came to be known as the National Aquatic Resource Surveys (NARS). NARS was designed to answer national-scale questions regarding water quality; questions which could not be easily answered by aggregating the individual state's water quality reports required under CWA sections 305(b) and 303(d). Each year one of four primary water body types is evaluated under the NARS program. Water body types include rivers and streams, lakes and reservoirs, wetlands, and coastal waters. Annual reports for each water body type are broken down into large regions in order to standardize water quality benchmarks and reporting as much as possible within the regions. This allows NARS to provide a statistically-valid snapshot or "report card" of water quality across large regions and water body types within the United States.

The NARS program differs from most State water quality sampling in that NARS sites are randomly selected each year based on a statistically designed randomization process. Random

selection is a key component of the statistically-valid sampling required by the NARS program. By contrast, LDEQ's water quality monitoring program is designed to target nearly all of the water body subsegments identified in Louisiana's water quality regulations (LAC 33:IX.1123.Table 3). In addition, LDEQ's monitoring sites are frequently located at bridge crossings or piers to facilitate the quick and efficient sample runs required to meet certain parameter holding times for laboratory analysis. This targeted approach, with occasional modifications to site locations over the years, has been in place in Louisiana since 1958. It allows LDEQ to assess all of the major water bodies in the state and many of the smaller, more remote ones as well. The approach also allows LDEQ to develop long-term trends analysis on many of the State's water bodies due to consistent sampling over many years. Both the NARS and LDEQ approaches have their merits and weaknesses, which should be taken into account when evaluating the results. More information on NARS, including sampling methods and statistical data analysis, can be found on the EPA website at, https://www.epa.gov/national-aquatic-resource-surveys/learn-about-national-aquatic-resource-surveys.

In January 2016 USEPA released its final report for the 2010 National Coastal Conditions Assessment (NCCA) (USEAP 2015). The Gulf Coast portion of the report sampled 240 sites from Texas to Florida to assess the condition of the coast (Figure 3.2.9). Water quality indicators used for the NCCA can be found in Table 3.2.11. Figure 3.2.9 also shows a summary of USEPA's findings for the entire Gulf Coast based on the indicators in Table 3.2.11. It is important to note that statistical surveys such as the 2010 NCCA only provide a statistically-valid overview of conditions on a broad regional scale and cannot be used to indicate conditions at specific locations. This is due to the fact that only one sample for each indicator was collected on one day. While sampling of this nature can be scaled up statistically to indicate regional or national conditions, it is not adequate to provide an accurate long-term assessment at individual locations.

From June-August 2010 USEPA and its contractors sampled 86 sites on 37 separate coastal Louisiana water bodies. Based on their results LDEQ attempted to develop a state-scale evaluation of the data to provide an estimate of overall coastal conditions within Louisiana. Of the indicators used by the NCCA (Table 3.2.11) only two, dissolved oxygen and pH, have numerical water quality criteria in Louisiana's water quality regulations (LAC 33:IX.1123). While pH was one of the indicators, no pH data was available at the time of this analysis.

Because NCCA indicators are evaluated against regional coastal water quality benchmarks, in this case Gulf Coast waters, none of the benchmarks used by USEPA appear to be appropriate for Louisiana conditions.

Figure 3.2.9.
Summary of USEPA National Coastal Condition Assessment. (From National Coastal Condition Assessment (USEPA 2015)).

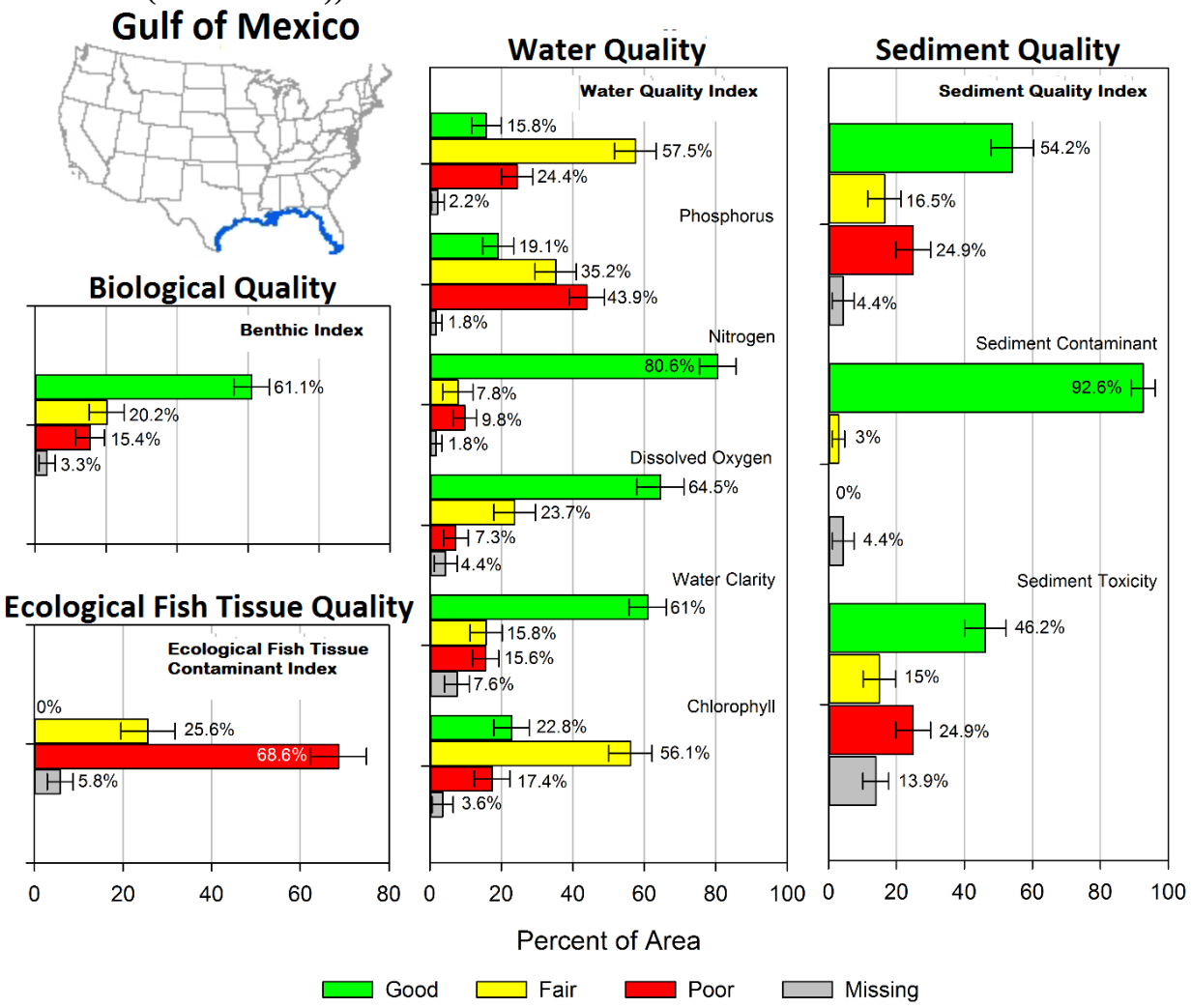


Table 3.2.11.
Water quality indicators used by USEAP's National Coastal Condition Assessment of Gulf of Mexico coastal waters.

Biological Indicators	Chemical Indicators	Physical Indicators
Benthic macroinvertebrates	Phosphorus	Dissolved oxygen
	Nitrogen	Salinity
	Ecological fish tissue contaminants	Water clarity
	Sediment contaminants	pH
	Sediment toxicity	Chlorophyll a

Many of the indicators used by USEPA have not been sampled or evaluated by LDEQ; therefore, it is not possible to determine if the benchmarks are suitable for Louisiana's coastal waters. The likely unsuitability of the benchmarks is due to the fact that much of Louisiana's coastal bays and estuaries are naturally highly turbid and nutrient rich. This is due to the historical and current influence of the Mississippi and Atchafalaya Rivers. In addition, four other significant rivers – Sabine, Mermentau, Vermilion, and Pearl – enter the Louisiana Gulf coast waters from Louisiana, Texas and Mississippi, contributing additional nutrient and sediment loads. Countless smaller bayous drain through the marshes and coastal prairies of south Louisiana, also contributing sediment and nutrient loading to the coastal waters of the state. In many cases Louisiana's coastal marshes and wetlands are starved of nutrients and sediment due to the leveeing of the Mississippi and Atchafalaya rivers. As a result, the benchmarks used by USEPA, which are believed to be low compared to typical Louisiana coastal waters, could actually work against coastal restoration efforts underway in the state.

Due to the preceding indicator considerations, LDEQ chose to only evaluate dissolved oxygen (DO) at this time. Comparing USEPA's DO data for all water depths to the Louisiana water quality criteria of 4.0 mg/L or 5.0 mg/L DO, depending on the water body, found that 925 of 1,030 samples met or exceeded the criteria. This amounts to 89.8% falling into USEPA's NCCA rating of "good." A total of 68 (6.6%) of samples were between 2.0 mg/L and 4.0 mg/L or 5.0 mg/L DO; the values of 4.0 and 5.0 again reflecting Louisiana DO criteria. Lastly, only 37 samples (3.6%) were below 2.0 mg/L DO. Using USEPA's ranking system for evaluating DO quality in Louisiana's coastal waters, these percentages place dissolved oxygen in the "good" category for overall conditions.

In addition to evaluating DO at all sample depths, LDEQ also evaluated DO at a depth of 1 meter; the typical sample depth for LDEQ's ambient monitoring program. At 1 meter 174 (94.6%) of 184 samples were greater than the criteria of 4.0 mg/L or 5.0 mg/L. Eight results, (4.3%) were between 2.0 mg/L and 4.0 mg/L or 5.0 mg/L, while only 2 results (1.1%) were below 2.0 mg/L. This again places Louisiana's coastal waters in the overall "good" category for DO according to USEPA's NCCA rating system.

For more information concerning USEPA's 2010 National Coastal Conditions Assessment please visit, http://www.epa.gov/national-aquatic-resource-surveys/ncca. For information regarding USEPA's National Aquatic Resource Surveys, which include The National Lakes Assessment; The National Rivers and Streams Assessment; and the National Wetlands Conditions Assessment; please visit, http://www.epa.gov/national-aquatic-resource-surveys.

Chapter 3: River and Stream Water Quality Assessment

The information reported in Table 3.3.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The river miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.3.2. The miles and count impacted by various suspected sources of impairment are shown in Table 3.3.3. Tables 3.3.2 and 3.3.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact, and each subsegment may have multiple designated uses. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendices A, B.

Table 3.3.1

Summary of designated use support for Louisiana rivers and streams, *2016 Integrated Report* assessment (reported in miles (water body count)).

Designated Uses	Size Fully Supported		Size Not Supported		Size Not Assessed		Total Size for Designated Use	
Primary Contact Recreation	6,209	(220)	2,971	(112)	10	(1)	9,190	(333)
Secondary Contact Recreation	9,135	(328)	209	(16)	10	(1)	9,354	(345)
Fish and Wildlife Propagation	2,793	(92)	6,462	(246)	10	(1)	9,264	(339)
Drinking Water Supply	669	(15)	400	(7)			1,069	(22)
Limited Aquatic Life and Wildlife Use	27	(3)	63	(3)			90	(6)
Outstanding Natural Resource Waters	1,039	(39)	545	(22)			1,584	(61)
Oyster Propagation	333	(18)	137	(11)			470	(29)
Agriculture	2,034	(59)			10	(1)	2,044	(60)

Suspected Causes of Non-Support of Designated Uses

Table 3.3.2

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2016 Integrated Report* assessment (reported in miles (water body count)).

Suspected Cause of Impairment	Size	Count
1,1,1,2-Tetrachloroethane	12	1
1,2-Dichloroethane	44	2
2,3,7,8-Tetrachlorodibenzofuran	70	2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (only)	70	2
Atrazine	43	1
Benzo(a)pyrene (PAHs)	13	2
Bromoform	12	1
Chloride	584	24
Color	400	7
Copper	8	2
Fecal Coliform	2,961	109
Hexachlorobenzene	12	1
Hexachlorobutadiene	12	1
Lead	254	8
Mercury in Fish Tissue	2,395	73
Methyl Parathion	43	1
Nitrate/Nitrite (Nitrite + Nitrate as N)	893	38
Non-Native Aquatic Plants	530	27
Oxygen, Dissolved	4,125	155
pH, Low	148	5
Phenols	8	1
Phosphorus (Total)	829	36
Polychlorinated biphenyls	41	3
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	29	2
Sulfates	718	37
Temperature, water	86	7
Total Dissolved Solids	1,487	69
Turbidity	2,306	66

Suspected Sources of Non-Support of Designated Uses

Table 3.3.3

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in miles (water body count)).

Suspected Sources of Impairment	Size	Count
Agriculture	2,511	67
Animal Feeding Operations (NPS)	35	1
Atmospheric Deposition - Toxics	2,395	73
CERCLA NPL (Superfund) Sites	13	2
Changes in Tidal Circulation/Flushing	7	1
Construction Stormwater Discharge (Permitted)	49	3
Contaminated Sediments	13	2
Discharges from Municipal Separate Storm Sewer Systems (MS4)	86	6
Drainage/Filling/Loss of Wetlands	30	1
Dredging (e.g., for Navigation Channels)	40	1
Drought-related Impacts	423	17
Flow Alterations from Water Diversions	147	5
Forced Drainage Pumping	56	5
Freshets or Major Flooding	76	5
Highways, Roads, Bridges, Infrastructure (New Construction)	7	1
Impacts from Hydrostructure Flow Regulation/modification	67	2
Industrial Point Source Discharge	384	15
Industrial/Commercial Site Stormwater Discharge (Permitted)	8	1
Introduction of Non-native Organisms (Accidental or Intentional)	530	27
Livestock (Grazing or Feeding Operations)	464	16
Managed Pasture Grazing	21	1
Manure Runoff	13	1
Marina/Boating Sanitary On-vessel Discharges	111	7
Municipal (Urbanized High Density Area)	36	2
Municipal Point Source Discharges	524	26
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	18	1
Natural Sources	2,883	132
Naturally Occurring Organic Acids	148	5
Non-irrigated Crop Production	11	1
Nonpoint Source	18	1

Table 3.3.3

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in miles (water body count)).

Suspected Sources of Impairment	Size	Count
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	1,859	80
Package Plant or Other Permitted Small Flows Discharges	820	42
Petroleum/natural Gas Activities	44	2
Residential Districts	86	3
Runoff from Forest/Grassland/Parkland	285	8
Rural (Residential Areas)	311	10
Sand/gravel/rock Mining or Quarries	30	1
Sanitary Sewer Overflows (Collection System Failures)	398	13
Seafood Processing Operations	7	1
Sediment Resuspension (Clean Sediment)	96	8
Sewage Discharges in Unsewered Areas	469	20
Silviculture Activities	378	14
Silviculture Harvesting	49	3
Site Clearance (Land Development or Redevelopment)	161	7
Source Unknown	3,892	110
Sources Outside State Jurisdiction or Borders	145	6
Transfer of Water from an Outside Watershed	14	1
Unrestricted Cattle Access	13	1
Upstream Source	55	4
Waterfowl	231	11
Wet Weather Discharges (Nonpoint Source)	21	1
Wildlife Other than Waterfowl	433	20

Chapter 4: Lake Water Quality Assessment

The information reported in Table 3.4.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The lake acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.4.2. The acres and count impacted by various suspected sources of impairment are shown in Table 3.4.3. Tables 3.4.2 and 3.4.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendices A, B.

Table 3.4.1

Summary of designated use support for Louisiana lakes, *2016 Integrated Report* assessment (reported in acres (water body count)).

Designated Use	Size Fully Supported	Size Not Supported	Not Assessed	Total Size for Designated Use
Primary Contact Recreation	573,582 (50)	82,344 (12)	2,284 (3)	658,210 (65)
Secondary Contact Recreation	646,678 (61)	9,248 (1)	2,284 (3)	658,210 (65)
Fish and Wildlife Propagation	35,789 (10)	620,137 (52)	2,284 (3)	658,210 (65)
Drinking Water Supply	246,815 (9)	15,599 (2)	1,158 (1)	263,572 (12)
Outstanding Natural Resource Waters		38 (1)		38 (1)
Agriculture	425,672 (15)		326 (1)	425,998 (16)

Suspected Causes of Non-Support of Designated Uses

Table 3.4.2

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Cause of Impairment	Size	Count
Arsenic	24	1
Chloride	51,840	1
Color	15,599	2
Fecal Coliform	89,339	11

Table 3.4.2

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Cause of Impairment	Size	Count
Hexachlorobenzene	24	1
Hexachlorobutadiene	24	1
Lead	24	1
Mercury	24	1
Mercury in Fish Tissue	318,481	20
Nitrate/Nitrite (Nitrite + Nitrate as N)	11,939	6
Non-Native Aquatic Plants	319,163	16
Oxygen, Dissolved	131,153	23
pH, High	18,202	3
Phosphorus (Total)	11,939	6
Polychlorinated biphenyls	2,260	3
Sulfates	24	1
Temperature, water	2,253	2
Total Dissolved Solids	109,161	15
Turbidity	242,767	17

Suspected Sources of Non-Support of Designated Uses

Table 3.4.3

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Sources of Impairment	Size	Count
Agriculture	134,744	14
Algae Bloom	18,202	3
Atmospheric Deposition - Toxics	318,457	19
Construction Stormwater Discharge (Permitted)	4,224	1
Contaminated Sediments	24	1
Discharges from Municipal Separate Storm Sewer Systems (MS4)	84	2
Drought-related Impacts	5,282	2
Industrial Point Source Discharge	17,451	3
Industrial/Commercial Site Stormwater Discharge (Permitted)	84	2

Table 3.4.3

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Sources of Impairment	Size	Count
Introduction of Non-native Organisms (Accidental or Intentional)	319,163	16
Livestock (Grazing or Feeding Operations)	26,880	1
Municipal Point Source Discharges	15,251	1
Natural Sources	215,599	20
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	8,064	2
Package Plant or Other Permitted Small Flows Discharges	10,349	2
Pesticide Application	1,594	1
Runoff from Forest/Grassland/Parkland	7,104	1
Sanitary Sewer Overflows (Collection System Failures)	9,272	2
Sediment Resuspension (Clean Sediment)	55,258	3
Sewage Discharges in Unsewered Areas	19,184	11
Silviculture Activities	11,101	3
Silviculture Harvesting	4,224	1
Site Clearance (Land Development or Redevelopment)	15,219	3
Source Unknown	350,665	28
Streambank Modifications/destabilization	1,747	1
Unspecified Land Disturbance	2,598	1
Upstream Source	24	1
Waterfowl	70,362	4

Chapter 5: Estuary and Coastal Water Quality Assessment

The information reported in Table 3.5.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The estuary square miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.5.2. The square miles and count impacted by various suspected sources of impairment are shown in Table 3.5.3. Tables 3.5.2 and 3.5.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendices A, B.

Table 3.5.1

Summary of designated use support for Louisiana estuaries, *2016 Integrated Report* assessment (reported in square miles (water body count)).

Designated Use	Size Fully Supported	Size Not Supported	Total Size for Designated Use
Primary Contact Recreation	4,466 (49)	488 (3)	4,954 (52)
Secondary Contact Recreation	4,468 (50)	486 (2)	4,954 (52)
Fish and Wildlife Propagation	3,194 (38)	1,760 (14)	4,954 (52)
Oyster Propagation	3,195 (33)	1,073 (7)	4,268 (40)

Suspected Causes of Non-Support of Designated Uses

Table 3.5.2

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected causes of impairment, *2016 Integrated Report* assessment (reported in square miles (water body count)).

Suspected Cause of Impairment	Size	Count
Fecal Coliform	1,075	8
Mercury in Fish Tissue	1,657	9
Non-Native Aquatic Plants	91	1
Oxygen, Dissolved	514	7

Suspected Sources of Non-Support of Designated Uses

Table 3.5.3

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in square miles (water body count)).

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition - Toxics	1,657	9
Discharges from Municipal Separate Storm Sewer Systems (MS4)	2	1
Introduction of Non-native Organisms (Accidental or Intentional)	91	1
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	411	2
Natural Sources	676	6
Nonpoint Source	6	1
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	404	3
Package Plant or Other Permitted Small Flows Discharges	581	3
Sanitary Sewer Overflows (Collection System Failures)	4	2
Sewage Discharges in Unsewered Areas	7	1
Source Unknown	1,748	10
Waterfowl	296	4
Wet Weather Discharges (Nonpoint Source)	2	1
Wildlife Other than Waterfowl	209	3

Chapter 6: Wetland Water Quality Assessment

The information reported in Table 3.6.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The wetland acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.6.2. The acres impacted by various suspected sources of impairment are shown in Table 3.6.3. Tables 3.6.2 and 3.6.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendices A, B.

Table 3.6.1

Summary of designated use support for Louisiana wetlands, *2016 Integrated Report* assessment (reported in acres (water body count)).

Designated Use	Size Fully Supported	Size Not Supported	Not Assessed	Total Size for Designated Use
Primary Contact Recreation	1,025,280 (6)			1,025,280 (6)
Secondary Contact Recreation	1,025,280 (6)		51,773 (10)	1,077,053 (16)
Fish and Wildlife Propagation	622,720 (3)	402,560 (3)	51,773 (10)	1,077,053 (16)
Drinking Water Supply	464,000 (1)			464,000 (1)
Oyster Propagation		72,320 (1)		72,320 (1)

Suspected Causes of Non-Support of Designated Uses

Table 3.6.2

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Cause of Impairment	Size	Count
Chloride	7,680	1
Fecal Coliform	72,320	1
Mercury in Fish Tissue	199,040	1
Oxygen, Dissolved	402,560	3
Sulfates	7,680	1
Total Dissolved Solids	7,680	1

Suspected Sources of Non-Support of Designated Uses

Table 3.6.3

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected sources of impairment, *2016 Integrated Report* assessment (reported in acres (water body count)).

Suspected Sources of Impairment	Size	Count
Agriculture	195,840	1
Atmospheric Deposition - Toxics	199,040	1
Freshets or Major Flooding	7,680	1
Natural Sources	206,720	2
Source Unknown	199,040	1
Waterfowl	72,320	1
Wildlife Other than Waterfowl	72,320	1

Chapter 7: Public Health/Aquatic Life Concerns

Fishing and Swimming Advisories Currently in Effect

LDEQ currently issues fish consumption and swimming advisories in conjunction with the LDHH Health/Fish Consumption Advisories Program. Fish consumption advisories are set using a risk assessment-based method that establishes consumption levels designed to prevent adverse effects on public health. Risk assessments are used to determine safe consumption levels for different segments of the population. For example, children, women of childbearing age, or breastfeeding women are often considered separately in developing risk assessments because this population is generally considered to be at greater risk from consumption of contaminated seafood. Therefore, limited consumption advisories will often be stricter for this population.

Swimming advisories are generally established due to fecal coliform contamination of a water body. However, a limited number of swimming advisories have been based on chemical contamination of water or sediments. Fecal coliform contamination of a water body can be caused by a number of possible sources including absent or inadequate sewage treatment systems, poorly maintained septic tanks, direct sewage discharges from camps, pasture and animal holding area runoff, and wildlife. Efforts are being made to correct these problems statewide. For the latest information on advisories please refer to LDEQ's website at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1631.

PART IV: GROUNDWATER ASSESSMENT

Introduction

The LDEQ Business Community Incentive and Outreach Division's (BCOID) Aquifer Sampling and Assessment Program (ASSET) provides water quality data from freshwater aquifers around the state. The ASSET Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers and aquifer systems across the state. The sampling process is designed so that all 14 aquifers and aquifer systems are monitored on a rotating basis, within a three year period so that each well is monitored every three years.

The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. Data presented for this report is from ASSET Program monitoring data collected in fiscal year 2015 from the Southern Hills Aquifer System. Table 4.1.1 shows that the Southern Hills Aquifer System is comprised in part of the Chicot Equivalent, Evangeline Equivalent, and Jasper Equivalent aquifer systems. This table also shows the hydrogeologic column of aquifers in Louisiana and the occurrence of the Southern Hills Aquifer System in regard to other aquifers in the state.

Table 4.1.2 is designed to provide an indication of the most critical contaminant sources and contaminants impacting groundwater resources in Louisiana. Table 4.1.3 provides a summary of Louisiana groundwater protection programs with listing of legislation, statutes, rules, and/or regulations that are in place. It also provides an indication of the comprehensive nature of groundwater protection activities in Louisiana. Table 4.1.4 provides information on the number of wells used for this report, the number of wells reporting non-detects for parameter groups of interest, and a more detailed look at the occurrence of nitrite-nitrate (NO2NO3). Table 4.1.5 lists the wells sampled, their total depths, the use made of produced waters, and date sampled. For quality control, duplicate samples were taken for each parameter at wells AN-9183Z, AV-680, EB-8599Z, JF-224, LI-7945Z, SJB-173, ST-FOLSOM, TA-284, WA-241, and WF-264.

Table 4.1.6 lists the field and conventional parameters, and Table 4.1.7 lists the inorganic (total metals) parameters for which samples were collected. They also detail the analytical results for those parameters for each well. Table 4.1.8 lists the field and conventional parameters' statistical values for minimum, maximum and average concentrations, while Table 4.1.9 provides a listing of inorganic statistics of minimum, maximum, and average values. It should be noted that per departmental standard procedure, one-half the detection limit is used when determining averages when a non-detect (ND) is reported. This procedure is utilized throughout the groundwater portion (**Part IV**) of this report whenever average values are listed or discussed. Also note that the terms Laboratory Detection Limit, Detection Limit (DL), and Method Detection Limit (MDL), are used interchangeably in **Part IV** of this report.

Ambient Monitoring Network for the Southern Hills Aquifer System

The data that follow were derived from the ASSET Program, which is conducted as a Clean Water Act activity. The objectives of the program are to determine and monitor the quality of groundwater produced from the freshwater aquifers across Louisiana, and to provide water

quality data to the department, other state and federal agencies, and the corporate and private citizens of Louisiana.

Data contained in Table 4.1.5 show that from August 2014 through July 2015, 57 wells were sampled which produce from the Southern Hills Aquifer System. Twenty-six of the 57 wells are classified as public supply, 14 are classified as industrial, 14 are classified as domestic (private) and the remaining 3 are classified as irrigation wells. The wells are located in 17 parishes in the southeast area of the state.

Non-analytical well information for registered water wells, such as depth, use categorization, and aquifer assignment were obtained from the Louisiana Department of Natural Resources' (LDNR) Strategic Online Natural Resources Information System (SONRIS).

As noted above and shown in Table 4.1.1, the Southern Hills Aquifer System is comprised in part of the Chicot Equivalent, Evangeline Equivalent, and the Jasper Equivalent Aquifer systems. In the geological and hydrogeological discussion that follows, these 3 aquifers are presented separately.

Chicot Equivalent Aquifer System (26 Wells)

Geology

The Chicot Equivalent Aquifer System is composed of the Pleistocene aged aquifers of the New Orleans area, the Baton Rouge area, and the St. Tammany, Tangipahoa, and Washington Parishes. The aquifers are in Pleistocene aged alluvial and terrace deposits. The sedimentary sequences that make up the aquifer system are subdivided into several aquifer units separated by confining beds. Northward within southeast Louisiana, fewer units are recognized because some younger units pinch out updip and some clay layers present to the south disappear. Where clay layers are discontinuous or disappear, aquifer units coalesce. The aquifers are moderately well, to well sorted, and consist of fine sand near the top, grading to coarse sand and gravel in lower parts and generally confined by silt and clay layers.

Hydrogeology

The deposits that constitute the individual aquifers are not readily differentiated at the surface and act as one hydraulic system that can be subdivided into several hydrologic zones in the subsurface. The Mississippi River Valley is entrenched into the Pleistocene strata in the western part of the system, resulting in water movement between the river, the shallow sands, and the Pleistocene aquifers. Recharge occurs primarily by the direct infiltration in interstream, upland outcrop areas, by the movement of water between aquifers, and between the aquifers and the Mississippi River. The hydraulic conductivity varies between 10-200 feet/day.

The maximum depths of occurrence of freshwater in the Chicot Equivalent range from 350 feet above sea level, to 1,100 feet below sea level. The range of thickness of the freshwater interval in the Chicot Equivalent is 50 to 1,100 feet. The depths of the 26 Chicot Equivalent wells that were monitored in conjunction with ASSET range from 90 to 775 feet.

Evangeline Equivalent Aquifer System (16 Wells)

Geology

The Evangeline Equivalent Aquifer System is composed of the Pliocene aged aquifers of the Baton Rouge area and St. Tammany, Tangipahoa, and Washington Parishes. These Pliocene sediments outcrop in southwestern Mississippi. The sedimentary sequences that make up the aquifer system are subdivided into several aquifer units separated by confining beds. Northward within southeast Louisiana, fewer units are recognized because some younger units pinch out updip and some clay layers present to the south disappear. Where clay layers are discontinuous or disappear, aquifer units coalesce. The aquifers consist of moderately to well sorted, fine to medium grained sands, with interbedded coarse sand, silt, and clay.

Hydrogeology

The deposits that constitute the individual aquifers are not readily differentiated at the surface and act as one hydraulic system that can be subdivided into several hydrologic zones in the subsurface. A zone or ridge of saline water occurs within the Pliocene sediments beneath the Mississippi River alluvial valley. Recharge occurs primarily by the direct infiltration of rainfall in interstream, upland outcrop areas, and by the movement of water between aquifers. The hydraulic conductivity varies between 10-200 feet/day.

The maximum depths of occurrence of freshwater in the Evangeline Equivalent range from 0 to 2,500 feet below sea level. The range of thickness of the fresh water interval in the Evangeline Equivalent is 50 to 1,500 feet. The depths of the 16 Evangeline Equivalent wells that were monitored in conjunction with the ASSET Program range from 185 to 2,004 feet.

Jasper Equivalent Aquifer System (15 Wells)

Geology

The Jasper Equivalent Aquifer System is composed of the Miocene aged aquifers of the Florida Parishes and Pointe Coupee Parish that outcrop in southwestern Mississippi. The sedimentary sequences that make up the aquifer system are subdivided into several aquifer units separated by confining beds. Northward within southeast Louisiana, fewer units are recognized because some younger units pinch out updip and some clay layers present to the south disappear. Where clay layers are discontinuous or disappear, aquifer units coalesce. The aquifers consist of fine to coarse sand and gravel, with grain size increasing and sorting decreasing with depth.

Hydrogeology

The deposits that constitute the individual aquifers are not readily differentiated at the surface and act as one hydraulic system that can be subdivided into several hydrologic zones in the subsurface. A zone or ridge of saline water occurs within the Miocene sediments beneath the Mississippi River alluvial valley. Recharge occurs primarily by the direct infiltration of rainfall in interstream, upland outcrop areas, and by the movement of water between aquifers. The hydraulic conductivity varies between 10-200 feet/day.

The maximum depths of occurrence of freshwater in the Jasper Equivalent aquifer system range from 500 to 3,200 feet below sea level. The range of thickness of the fresh water interval in the

Jasper Equivalent aquifer system is 1,600 to 2,350 feet. The depths of the wells that were monitored in conjunction with the ASSET Program range from 960 to 2,700 feet.

Program Parameters

The field parameters checked at each sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 4.1.6 The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 4.1.7 These tables also show the field and analytical results determined for those analytes. Tables 4.1.8 and 4.1.9 provide a statistical overview of conventional and inorganic data for the Southern Hills Aquifer System, listing the minimum, maximum, and average results for these parameters. Table 4.1.10 lists the Federal Maximum Contaminant Level (primary and secondary) and Action Level for applicable parameters.

In addition to the conventional and inorganic analytical parameters, the target analyte list includes three other categories of compounds: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and pesticides/PCBs. Due to the large number of analytes in these categories, tables were not prepared showing the analytical results for these compounds. A discussion of detections from any of these three categories, if necessary, can be found in their respective sections. Tables 4.1.11, 4.1.12, and 4.1.13 list the target analytes and detection limits for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Figure 4.1.1 shows the geographic locations of the Southern Hills Aquifer System and associated wells.

Interpretation of Data

Under the Federal Safe Drinking Water Act, EPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that EPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, the ASSET Program does use MCLs as a benchmark for further evaluation. A review of laboratory data contained in Table 4.1.7 shows that one industrial use well, SJ-226, exceeded the MCL for arsenic.

EPA has also set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 4.1.6 and 4.1.7 show that one or more secondary MCLs (SMCLs) were exceeded in 38 of the 57 wells sampled in the Southern Hills Aquifer System, with a total of 52 SMCLs being exceeded.

In addition to primary and secondary MCLs, EPA has established Action Levels for particular compounds. If the action levels are exceeded, then a Treatment Technique is required by public water supply systems to control the corrosiveness of the distributed water. The data show that no Action Level was exceeded in any of the Southern Hills Aquifer System wells sampled for this time period.

Field and Conventional Parameters

Table 4.1.6 shows the field and conventional parameters for which samples are collected at each well and the analytical results for field and laboratory parameters. Table 4.1.8 provides an overview of these parameters for the Southern Hills Aquifer System, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards

A review of the analysis listed in Table 4.1.6 shows that no primary MCL was exceeded for field and conventional parameters for this reporting period. Those ASSET wells reporting turbidity levels greater than 1.0 NTU do not exceed the Primary MCL of 1.0, as this standard applies to surface water systems and groundwater systems under the direct influence of surface water. The Louisiana Department of Health and Hospitals has determined that no public supply well in Louisiana is in this category.

Federal Secondary Drinking Water Standards

A review of the analysis listed in Table 4.1.6 shows that 25 wells exceeded the SMCL for pH, 4 wells exceeded the SMCL for chloride, 6 wells exceeded the SMCL for color, and 8 wells exceeded the SMCL for total dissolved solids (TDS). Laboratory results override field results in exceedance determinations, thus only lab results will be counted in determining SMCL exceedance numbers for TDS. Following is a list of SMCL parameter exceedances with well number and results:

pH (SMCL = 6.5 – 8.5 Standard Units):

EB-1003 – 8.81 SU
EB-630 – 8.94 SU
EB-854 – 8.89 SU
EF-5329Z – 5.96 SU
LI-185 – 8.57 SU
LI-229 – 8.86 SU
LI-299 – 8.76 SU
SH-5333Z – 6.48 SU
SH-77 – 6.40 SU
ST-11516Z – 8.67 SU
ST-5245Z – 5.27 SU
ST-532 – 8.94 SU
ST-820 – 8.85 SU
ST-FOLSOM – 8.80 SU (Original and Duplicate)
TA-286 – 5.95 SU
TA-520 – 5.55 SU
TA-560 – 8.79 SU
TA-7627Z – 6.36 SU
TA-826 – 9.08 SU
WA-241 – 5.42 SU (Original and Duplicate)
WA-248 – 8.58 SU
WA-5295Z – 5.50 SU
WA-5311Z – 4.13 SU
WBR-181 – 9.14 SU
WF-DELEE – 5.78 SU

Chloride (SMCL = 250 mg/L):

AN-6297Z – 629 mg/L
EB-630 – 255 mg/L
SC-179 – 346 mg/L
SJB-173 – 307 mg/L (Original), 313 mg/L (Duplicate)

Color (SMCL = 15 PCU)

JF-224 – 100 PCU (Original and Duplicate) SC-179 - 35 PCU
SJB-173 – 30 PCU (Original and Duplicate) ST-1135 – 15 PCU
ST-6711Z – 40 PCU WA-248 – 30 PCU

Total Dissolved Solids (SMCL = 500 mg/L):

AN-316 – 510 mg/L AN-321 – 595 mg/L
AN-337 – 565 mg/L AN-6297Z – 1,220 mg/L
EB-630 – 635 mg/L JF-224 – 805 mg/L (Original), 820 mg/L (Duplicate)
SC-170 – 1,060 mg/L SJB-173 – 960 mg/ L (Original), 905 mg/L (Duplicate)

Inorganic Parameters

Table 4.1.7 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 4.1.9 provides an overview of inorganic data for the Southern Hills Aquifer System, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards

A review of the analyses listed on Table 4.1.7 shows that one primary MCL was exceeded for inorganic (total metals) parameters in one well. Well SJ-226, an industrial use well, exceeded the drinking water standard for arsenic (MCL = 10 µg/L), with a reported laboratory value of 10.4 µg/L. Historical arsenic values reported from analysis of an adjacent well of similar depth are similar to well SJ-226. The consistent occurrence of arsenic with concentrations at or slightly above the drinking water standard has been established. Close attention has been given to the occurrence of arsenic at this location, and due to the constant detection at a consistent concentration, it is believed to be naturally occurring, not unlike other areas in Louisiana along the Mississippi River.

Federal Secondary Drinking Water Standards

Laboratory data contained in Table 4.1.7 show that 9 wells exceeded the secondary MCL for iron.

Iron (SMCL = 300 µg/L):

EB-34 – 8,680 µg/L
EB-8599Z – 348 µg/L (Original), 338 µg/L (Duplicate)
JF-224 – 349 µg/L (Original), 330 µg/L (Duplicate)
SJ-226 – 1,540 µg/L
SJB-173 – 547 µg/L (Original), 536 µg/L (Duplicate)
ST-11516Z – 334 µg/L

Volatile Organic Compounds

Table 4.1.11 shows the volatile organic compound (VOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a VOC would be discussed in this section.

Two wells reported detectable quantities of VOCs. ST-820, a back-up public supply well reported several VOCs at low levels. After interviewing the well owner and resampling the well, it was determined that the original occurrence of VOCs was due to a new public supply well being drilled and developed to replace well ST-820. None of the VOCs detected in the original sample were detected in the resample, except for chloroform, as noted below.

Volatile Organic Compounds detected in Southern Hills Aquifer System well ST-820

	Original Sample	Resample Results
Bromodichloromethane	7.8 µg/L	ND
Carbon Tectrachloride	10.2 µg/L	ND
Chloroform	67.0 µg/L	0.55 µg/L
Chloromethane	4.1 µg/L	ND
Dibromochloromethane	1.21 µg/L	ND

Chloroform was also detected in domestic well SH-5333Z at 0.58 µg/L, which is just above the laboratory reporting detection limit of 0.50 µg/L. Due to the reported low concentration of this compound, and due to it being a common lab contaminant, and because there is no MCL established for it, chloroform was not resampled in this well.

There were no other detections of VOCs at or above their laboratory reporting detection limit during the sampling of the Southern Hills Aquifer System

Semi-Volatile Organic Compounds

Table 4.1.12 shows the semi-volatile organic compound (SVOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a SVOC would be discussed in this section.

There were no confirmed detections of any SVOC at or above its laboratory reporting detection limit during the sampling of the Southern Hills Aquifer System.

Pesticides and PCBs

Table 4.1.13 shows the pesticide and PCB parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a pesticide or PCB would be discussed in this section.

Two pesticides were reported at low levels in 2 separate wells (both detections were reported as estimated values by the analyzing laboratory). The pesticide, P,P'-DDT reported an estimated value of 0.029 µg/L in public supply well WA-248. Because this was an estimated result by the laboratory, and because the value was just over the reporting detection limit of 0.20 µg/L, and there being no MCL established for this analyte, the well was not resampled to confirm its presence.

The pesticide heptachlor (with an MCL of 0.4 µg/L) was reported at an estimated value of 0.039 µg/L in back-up public supply well, ST-820. This well also reported several VOCs, as noted in the Volatile Organic Compounds section, and was resampled for VOCs but not for pesticides. Due to the initial occurrence of VOCs being caused by drilling and developing a nearby public supply well, it is probable the estimated occurrence of this compound was caused by the nearby activities also, and is not due to contamination of the aquifer.

No other compound from this category was detected, or estimated, at or above its laboratory reporting detection limit during the sampling of the Southern Hills Aquifer System.

Summary

In summary, the data show that the ground water produced from the Southern Hills Aquifer System is soft (classification based on hardness scale from: Peavy, H. S. et al., Environmental Engineering, 1985). The data also show that this aquifer is of good quality when considering short term or long term health based risk exposure limits in that only one primary MCL was exceeded at just over the MCL. The data show that the Southern Hills Aquifer System is of fair to good quality based on taste, odor or appearance guidelines, with a total 52 SMCLs exceeded in approximately 38 of the 57 wells sampled.

Table 4.1.1

Hydrogeologic column of aquifers in Louisiana.

SYSTEM	SERIES	Stratigraphic Unit		Hydrogeologic Unit: Northern Louisiana — Aquifer or confining unit	Central and southwestern Louisiana — Aquifer system or confining unit	Central and southwestern Louisiana — Aquifer or confining unit: Lake Charles area	Central and southwestern Louisiana — Aquifer or confining unit: Rice growing area	Southeastern Louisiana — Aquifer system or confining unit	Southeastern Louisiana — Aquifer[1] or confining unit: Baton Rouge area	Southeastern Louisiana — Aquifer[1] or confining unit: St. Tammany, Tangipahoa, and Washington Parishes	Southeastern Louisiana — Aquifer[1] or confining unit: New Orleans area and lower Mississippi River parishes
Quaternary	Pleistocene	Red River alluvial deposits Miss. River alluvial deposits Northern La. Terrace deposits Unnamed Pleistocene deposits		Red River alluvial aquifer or surficial confining unit Mississippi River alluvial aquifer or surficial confining unit Upland terrace aquifer or surficial confining unit	Chicot aquifer system or surficial confining unit	"200-foot" sand	Upper sand unit	Chicot Equivalent aquifer system[2] or surficial confining unit	Mississippi River alluvial aquifer or surficial confining unit Shallow sand "400-foot" sand "600-foot" sand	Upland terrace aquifer Upper Ponchatoula aquifer	Gramercy aquifer[3] Norco aquifer[3] Gonzales-New Orleans Aquifer[3] "1,200-foot" sand[3]
						"500-foot" sand "700-foot" sand	Lower sand unit				
Tertiary	Pliocene -----?----- Miocene	Fleming Formation	Blounts Creek Member	Pliocene-Miocene aquifers are absent in this area	Evangeline aquifer or surficial confining unit			Evangeline equivalent aquifer system[2] or surficial confining unit	"800-foot" sand "1,000-foot" sand "1,200-foot" sand "1,500-foot" sand "1,700-foot" sand	Lower Ponchatoula Aquifer Big Branch aquifer Kentwood aquifer Abita aquifer Covington aquifer Slidell aquifer	
			Castor Creek Member		Castor Creek confining unit			Unnamed confining unit	"2,000-foot" sand "2,400-foot" sand "2,800-foot" sand	Tchefuncte aquifer Hammond aquifer Amite aquifer Ramsay aquifer Franklinton aquifer	
			Williamson Creek Member Dough Hills Member Carnahan Bayou Member		Jasper aquifer system or surficial confining unit	Williamson Creek aquifer Dough Hills confining unit Carnahan Bayou aquifer		Jasper equivalent aquifer system[2] or surficial confining unit			
			Lena Member		Lena confining unit			Unnamed confining unit			
	-----?----- Oligocene	Catahoula Formation			Catahoula aquifer			*Catahoula equivalent aquifer system[2] or surficial confining unit			
		Vicksburg Group, undifferentiated		Vicksburg-Jackson confining unit							
	Eocene	Jackson Group, undifferentiated									
		Claiborne Group	Cockfield Formation	Cockfield aquifer or surficial confining unit							
			Cook Mountain Formation	Cook Mountain aquifer or confining unit							
			Sparta Sand	Sparta aquifer or surficial confining unit							
			Cane River Formation	Cane River aquifer or confining unit							
			Carrizo Sand ?	Carrizo-Wilcox aquifer or surficial confining unit							
	Paleocene	Wilcox Group, undifferentiated									
		Midway Group, undifferentiated		Midway confining unit							

No fresh water occurs in older aquifers

[1]Clay units separating aquifers in southeastern Louisiana are discontinuous and unnamed.
[2]Four aquifer systems as a group are called the Southern Hills aquifer system (*Catahoula equivalent aquifer system is not monitored by the ASSET Program).
[3]Four aquifers as a group are called the New Orleans aquifer system.

Source: DOTD/USGS Water Resources Special Report No. 9, 1995

Index to Table 4.1.2

Factors in selecting a contaminant source

A. Human health and/or environmental risk (toxicity)
B. Size of the population at risk
C. Location of the sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrogeologic sensitivity
F. State findings, other findings
G. Documented from mandatory reporting
H. Geographic distribution/occurrence
I. Other criteria - high to very high priority in localized areas of the state

Contaminants

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Fluoride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other - sulfates from gypsum stacks

Table 4.1.2
Major sources of groundwater contamination in the freshwater aquifers of Louisiana.

Contaminant Source	Ten Highest-Priority Sources(√)	Factors in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
On-farm agricultural mixing and loading procedures			
Land application of manure (unregulated)			
Storage and Treatment			
Land Application			
Material stockpiles			
Storage tanks (above ground)	√	A,B,C,D,E,F,G	B,C,D
Storage tanks (underground)	√	A,B,C,D,E,F,	B,C,D
Surface impoundments	√	A,B,C,D,E,F,G	C,D,G,H,J,L
Waste piles	√	D,G	I,M
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	√	A,B,C,D,E,F,G	A,B,C,D,E,H
Septic systems	√	C,D,G	A,B,C,D,E,H,J,L
Shallow injection wells			
Other			
Hazardous waste generators*			
Hazardous waste sites*			
Industrial facilities*			
Material transfer operations*			
Mining and mine drainage			
Pipelines and sewer lines	√	A,B,C,D,E,F,G	C,D,G
Salt storage and road salting			
Salt water intrusion	√	B,C,E,G	G
Spills	√	B,D,G	C,D
Transportation of materials			
Urban runoff	√	A,B,D,G	A,B,C,D,E,H,J,L
Small-scale manufacturing and repair shops			
Other sources (please specify)			

* Represents facilities with multiple sources of groundwater contamination rather than unit sources.

Table 4.1.3
State groundwater protection programs for Louisiana with their implementations status.

Programs or Activities	Check	Implementation Status	Responsible State Agency
Active SARA Title III Program	√	Fully established	LDEQ
Ambient groundwater monitoring system	√	Fully established	LDEQ
Aquifer vulnerability assessment	√	Fully established	LDEQ
Aquifer mapping	√	Fully established	LDEQ
Aquifer characterization	√	Continuing efforts	LDOTD
Comprehensive data management system	√	Continuing efforts	LDEQ
EPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)	√	Pending	LDEQ
Groundwater discharge permits	√	Fully established	LDNR(UIC)
Groundwater Best Management Practices	√	Continuing efforts	LDEQ
Groundwater legislation	√	Continuing efforts	LDNR
Groundwater classification	√	Continuing efforts	LDNR
Groundwater quality standards	√	Continuing efforts	LDEQ
Interagency coordination for groundwater protection initiatives	√	Continuing efforts	LDNR
Nonpoint source controls	√	Continuing efforts	LDEQ
Pesticide State Management Plan	√	Fully Established	LDAF
Pollution Prevention Program	√	Continuing efforts	LDEQ
Resource Conservation and Recovery Act (RCRA) Primacy	√	Fully established	LDEQ
Source Water Assessment Program	√	Fully established	LDEQ
State Superfund	√	Fully established	LDEQ
State RCRA Program incorporating more stringent requirements than RCRA Primacy	√	Continuing efforts	LDEQ
State septic system regulations	√	Fully established	LDHH
Underground storage tank installation requirements	√	Fully established	LDEQ
Underground Storage Tank Remediation Fund	√	Fully established	LDEQ
Underground Storage Tank Permit Program	√	Fully established	LDEQ
Underground Injection Control Program	√	Fully established	LDNR
Vulnerability assessment for drinking water/wellhead protection	√	Fully established	LDEQ
Well abandonment regulations	√	Fully established	LDNR
Wellhead Protection Program (EPA-approved)	√	Fully established	LDEQ
Well installation regulations	√	Fully established	LDNR

Table 4.1.4

Monitoring Data

Hydrogeologic Setting: **Southern Hills Aquifer System**
Spatial Description: **Southeast Louisiana**
Map Available: **See Figure 4.1.1**
Data Reporting Period: **August 2014 – July 2015**

Monitoring Data Type	Total No. of Wells Used in the Assess-ment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrite/nitrate concentrations range from background levels to less than or equal to 5 mg/l. No detections of parameters other than nitrite/nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable.			Nitrite/nitrate ranges from greater than 5 to less than or equal to 10 mg/l. Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs.	Parameters are detected at concentrations exceeding the MCLs	Number of wells removed from service	Number of wells requiring special treatment	Back-ground para-meters exceed MCLs
			ND	Number of wells in sensitive or vulnerable areas	Nitrite/ nitrate < 1 mg/l	Nitrite/ nitrate ≥ 1 to ≤5 mg/l	Number of wells in sensitive or vulnerable areas					
Ambient Monitoring Network	57	VOC	55	0				2				
		SVOC	57	0								
		NO2NO3	38	0	18	1	0	0				
		†Other		0				56	1			1

† For Other category, the following metals with Primary Drinking Water Standards or Action Levels were considered: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Selenium, and Thallium.

Table 4.1.5

List of ASSET wells and date sampled that are completed in the Southern Hills Aquifer System.

LDNR Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
AN-266	Ascension	9/23/2014	City of Gonzales	Chicot Equivalent	548	Public Supply
AN-316	Ascension	9/25/2014	Westlake Vinyls	Chicot Equivalent	478	Industrial
AN-321	Ascension	9/25/2014	Rubicon, Inc.	Chicot Equivalent	523	Industrial
AN-337	Ascension	9/25/2014	BASF Corp.	Chicot Equivalent	459	Public Supply
AN-500	Ascension	9/25/2014	Lion Copolymer	Chicot Equivalent	480	Industrial
AN-6297Z	Ascension	12/12/2014	Oxy Chemical	Chicot Equivalent	294	Industrial
AN-9183Z	Ascension	9/23/2014	Private Owner	Chicot Equivalent	630	Domestic
EB-1231	East Baton Rouge	8/19/2014	Georgia Pacific Corp.	Chicot Equivalent	280	Industrial
EB-34	East Baton Rouge	8/19/2014	ExxonMobile USA	Chicot Equivalent	453	Industrial
EB-8599Z	East Baton Rouge	8/21/2014	Private Owner	Chicot Equivalent	180	Domestic
EB-991B	East Baton Rouge	8/19/2014	Baton Rouge Water Works	Chicot Equivalent	565	Public Supply
EF-5329Z	East Feliciana	8/19/2014	Private Owner	Chicot Equivalent	97	Domestic
JF-224	Jefferson	12/15/2014	Entergy	Chicot Equivalent	775	Industrial
LI-5477Z	Livingston	12/23/2014	Private Owner	Chicot Equivalent	106	Domestic
LI-7945Z	Livingston	12/23/2014	French Settlement Water System	Chicot Equivalent	455	Public Supply
SC-179	St. Charles	12/15/2014	Union Carbide	Chicot Equivalent	460	Industrial
SH-5333Z	St. Helena	8/21/2014	Private Owner	Chicot Equivalent	230	Domestic
SH-77	St. Helena	8/19/2014	Transco	Chicot Equivalent	170	Public Supply
SJ-226	St. James	12/15/2014	Noranda Alumina, LLC	Chicot Equivalent	248	Industrial
SJB-173	St. John the Baptist	7/20/2015	E.I. Dupont	Chicot Equivalent	425	Industrial
ST-11516Z	St. Tammany	12/23/2014	Louisiana State Parks	Chicot Equivalent	340	Public Supply
ST-5245Z	St. Tammany	9/23/2014	Premier Pastures	Chicot Equivalent	90	Domestic
TA-520	Tangipahoa	8/21/2014	Private Owner	Chicot Equivalent	135	Irrigation
TA-7627Z	Tangipahoa	4/2/2015	Global Wildlife	Chicot Equivalent	120	Domestic
WA-5295Z	Washington	9/23/2014	Private Owner	Chicot Equivalent	100	Domestic
WA-5311Z	Washington	8/21/2014	Private Owner	Chicot Equivalent	90	Domestic

Table 4.1.5

List of ASSET wells and date sampled that are completed in the Southern Hills Aquifer System.

LDNR Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
AV-680	Avoyelles	4/1/2015	Avoyelles Water Commission	Evangeline Equivalent	553	Public Supply
EB-1003	East Baton Rouge	2/19/2015	Baton Rouge Water Works	Evangeline Equivalent	1,430	Public Supply
EF-MILEY	East Feliciana	2/11/2015	Private Owner	Evangeline Equivalent	185	Domestic
LI-299	Livingston	2/19/2015	Ward 2 Water District	Evangeline Equivalent	1,417	Public Supply
PC-325	Pointe Coupee	2/11/2015	Alma Plantation, Ltd.	Evangeline Equivalent	1,252	Industrial
SL-679	St. Landry	2/18/2015	Alon USA	Evangeline Equivalent	1,152	Industrial
ST-532	St. Tammany	2/12/2015	Northlake Hospital	Evangeline Equivalent	1,520	Public Supply
ST-6711Z	St. Tammany	4/2/2015	Private Owner	Evangeline Equivalent	860	Domestic
ST-820	St. Tammany	2/12/2015	Southern Manor MHP	Evangeline Equivalent	2,004	Public Supply
TA-10046Z	Tangipahoa	4/2/2015	Blue Crystal MHP	Evangeline Equivalent	590	Public Supply
TA-284	Tangipahoa	2/5/2015	City of Ponchatoula	Evangeline Equivalent	608	Public Supply
TA-286	Tangipahoa	2/3/2015	Town of Kentwood	Evangeline Equivalent	640	Public Supply
WA-241	Washington	2/9/2015	Private Owner	Evangeline Equivalent	400	Irrigation
WA-5210Z	Washington	2/5/2015	Private Owner	Evangeline Equivalent	752	Domestic
WBR-181	Webster	2/19/2015	Port of Greater Baton Rouge	Evangeline Equivalent	1,900	Industrial
WF-DELEE	West Feliciana	3/31/2015	Private Owner	Evangeline Equivalent	240	Domestic
EB-630	East Baton Rouge	6/16/2015	Baton Rouge Water Works	Jasper Equivalent	2,253	Public Supply
EB-854	East Baton Rouge	6/16/2015	City of Zachary	Jasper Equivalent	2,090	Public Supply
EF-272	East Feliciana	6/15/2015	Louisiana War Vets Home	Jasper Equivalent	1,325	Public Supply
LI-185	Livingston	6/16/2015	City of Denham Springs	Jasper Equivalent	2,610	Public Supply
LI-229	Livingston	6/16/2015	Ward 2 Water District	Jasper Equivalent	1,826	Public Supply
LI-257	Livingston	6/15/2015	Village of Albany	Jasper Equivalent	1,842	Public Supply
PC-275	Pointe Coupee	6/15/2015	Private Owner	Jasper Equivalent	1,912	Domestic
SH-104	St. Helena	6/15/2015	Cal Main Foods	Jasper Equivalent	1,652	Industrial
ST-1135	St. Tammany	5/27/2015	Lakeshore Estates	Jasper Equivalent	2,605	Public Supply
ST-995	St. Tammany	5/28/2015	Insta-Gator	Jasper Equivalent	2,290	Irrigation

Table 4.1.5

List of ASSET wells and date sampled that are completed in the Southern Hills Aquifer System.

LDNR Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
ST-FOLSOM	St. Tammany	5/27/2015	Village of Folsom	Jasper Equivalent	2,265	Public Supply
TA-560	Tangipahoa	5/28/2015	Town of Roseland	Jasper Equivalent	2,032	Public Supply
TA-826	Tangipahoa	5/28/2015	City of Ponchatoula	Jasper Equivalent	2,015	Public Supply
WA-248	Washington	5/28/2015	Town of Franklinton	Jasper Equivalent	2,700	Public Supply
WF-264	West Feliciana	6/15/2015	West Feliciana Parish Utilities	Jasper Equivalent	960	Public Supply

Table 4.1.6
Field measurements and conventional laboratory analytical results for parameters sampled.

DNR Well Number	pH SU	Sal. ppt	Sp. Cond. mmhos per cm	TDS g/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. µmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
	Laboratory Detection Limits (MDL) →					2	10/1	5	5	0.05	0.1	0.05	1	1	10	4.0	0.1
Drinking Water Limit/Type‡	≥6.5, ≤8.5	N/A	N/A	0.5	N/A	N/A	250 (S)	15 (S)	N/A	10 (P)	N/A	N/A	N/A	250 (S)	500 (S)	N/A	TT
	Field Parameters					Conventional Laboratory Parameters											
AN-266	7.77	0.15	0.323	0.21	23.82	134.0	14.7	< 5.0	50.0	< 0.05	0.40	0.27	285	4.1	200	5.0	0.31
AN-316	7.73	0.45	0.911	0.592	23.50	154.0	192.0	< 5.0	78.0	< 0.05	0.44	<0.05	9	< 1.0	510	< 4.0	0.53
AN-321	7.89	0.56	1.127	0.733	22.59	142.0	241.0	< 5.0	70.0	< 0.05	0.45	0.20	1,140	< 1.0	595	< 4.0	0.14
AN-337	7.62	0.50	1.020	0.663	23.62	134.0	200.0	< 5.0	94.0	< 0.05	0.71	0.12	990	1.8	565	< 4.0	0.97
AN-500	7.92	0.17	0.363	0.236	22.96	130.0	26.0	< 5.0	60.0	< 0.05	0.48	0.21	362	2.7	210	< 4.0	0.52
AN-6297Z	8.47	NO DATA	2,400	1.540	21.61	188.0	629.0	< 5.0	160	< 0.05	2.10	0.10	2,380	< 1.0	1,220	< 4.0	0.79
AN-9183Z	7.99	0.20	0.418	0.272	24.10	146.0	33.5	< 5.0	6.0	< 0.05	0.43	0.22	376	4.0	270	< 4.0	0.47
AN-9183Z	7.99	0.20	0.418	0.272	24.10	150.0	33.5	< 5.0	30.0	< 0.05	0.38	0.15	362	3.9	270	< 4.0	0.44
AV-680	7.76	0.21	0.431	0.280	22.19	248.0	16.5	5.0	12.0	< 0.05	1.40	0.19	319	5.4	265	< 4.0	0.25
AV-680	7.76	0.21	0.431	0.280	22.19	248.0	16.6	10.0	12.0	< 0.05	1.40	0.16	317	5.4	265	< 4.0	0.25
EB-1003	8.81	0.14	0.290	0.189	26.37	251.0	3.4	< 5.0	< 5.0	< 0.05	0.42	0.26	NO DATA	9.3	145	< 4.0	0.15
EB-1231	6.8	0.11	0.242	0.157	20.47	62.0	29.3	< 5.0	70.0	< 0.05	< 0.10	0.06	251	3.7	130	< 4.0	0.45
EB-34	6.65	0.16	0.329	0.214	22.81	142.0	9.2	10.0	64.0	0.059	0.27	0.46	334	< 1.0	225	12.0	37.7
EB-630	8.94	0.61	1.254	0.815	33.62	205.0	255.0	5.0	24.0	< 0.05	0.63	0.22	1,220	9.5	635	< 4.0	1.10
EB-854	8.89	0.17	0.359	0.233	29.51	205.0	3.1	5.0	8.0	< 0.05	0.50	0.26	354	10.2	180	< 4.0	0.53
EB-8599Z	7.18	0.09	0.184	0.120	21.45	66.0	21.1	< 5.0	62.0	< 0.05	< 0.10	0.18	192	6.8	220	< 4.0	1.80
EB-8599Z	7.18	0.09	0.184	0.120	21.45	62.0	12.0	< 5.0	64.0	< 0.05	< 0.10	0.12	192	4.1	160	< 4.0	1.50
EB-991B	7.02	0.12	0.265	0.172	23.25	118.0	3.0	< 5.0	24.0	< 0.05	< 0.10	0.19	282	8.9	170	< 4.0	0.58
EF-272	8.36	0.16	0.344	0.224	26.15	172.0	4.0	5.0	< 5.0	< 0.05	0.55	0.37	374	8.6	190	< 4.0	0.31
EF-5329Z	5.96	0.02	0.052	0.034	21.53	12.0	3.7	< 5.0	16.0	0.270	< 0.10	< 0.05	38	2.0	50	< 4.0	0.63
EF-MILEY	7.44	0.03	0.063	0.041	18.51	20.0	3.8	< 5.0	10.0	0.250	0.32	< 0.05	55	< 1.0	85	< 4.0	0.38
JF-224	8.10	0.72	1.433	0.931	22.39	334.0	90.7	100.0	72.0	< 0.05	1.40	0.57	1,380	< 1.0	805	< 4.0	0.78
JF-224	8.10	0.72	1.433	0.931	22.39	360.0	122.0	100.0	46.0	< 0.05	1.20	0.56	1,480	< 1.0	820	< 4.0	0.63
LI-185	8.57	0.13	0.283	0.184	32.84	154.0	3.6	< 5.0	16.0	< 0.05	0.30	0.24	274	9.9	165	< 4.0	0.55
LI-229	8.86	0.15	0.319	0.208	26.94	154.0	3.4	5.0	6.0	< 0.05	0.38	0.24	313	9.9	175	< 4.0	0.41
LI-257	8.33	0.12	0.251	0.163	28.82	585.0	3.2	< 5.0	< 5.0	< 0.05	0.35	0.27	268	10.4	140	< 4.0	0.29
LI-299	8.76	0.13	0.273	0.178	24.42	251.0	3.6	< 5.0	< 5.0	0.092	0.58	0.72	NO DATA	8.1	155	< 4.0	0.60
LI-5477Z	8.13	0.19	0.400	0.260	21.14	189.0	8.6	10.0	62.0	< 0.05	0.23	0.24	358	< 1.0	220	< 4.0	0.29

Table 4.1.6
Field measurements and conventional laboratory analytical results for parameters sampled.

DNR Well Number	pH SU	Sal. ppt	Sp. Cond. mmhos per cm	TDS g/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. µmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
	Laboratory Detection Limits (MDL) →					2	10/1	5	5	0.05	0.1	0.05	1	1	10	4.0	0.1
Drinking Water Limit/Type‡	≥6.5, ≤8.5	N/A	N/A	0.5	N/A	N/A	250 (S)	15 (S)	N/A	10 (P)	N/A	N/A	N/A	250 (S)	500 (S)	N/A	TT
	Field Parameters					Conventional Laboratory Parameters											
LI-7945Z	8.29	0.15	0.319	0.208	23.14	134.0	14.5	10.0	26.0	< 0.05	0.29	0.29	284	5.9	200	< 4.0	0.34
LI-7945Z	8.29	0.15	0.319	0.208	23.14	134.0	14.5	10.0	32.0	< 0.05	0.22	0.26	284	5.9	175	< 4.0	0.42
PC-275	7.93	0.32	0.665	0.432	23.79	287.0	26.8	25.0	< 5.0	< 0.05	0.99	0.43	688	7.1	350	< 4.0	0.62
PC-325	8.03	0.14	0.292	0.190	24.89	132.0	3.9	< 5.0	10.0	0.230	0.61	0.36	284	8.8	210	< 4.0	0.44
SC-179	6.81	0.96	1.882	1.223	22.31	440.0	346.0	35.0	92.0	< 0.05	2.70	0.39	1,880	< 1.0	1,060	< 4.0	0.33
SH-104	8.60	0.20	0.414	0.269	27.06	185.0	3.5	< 5.0	< 5.0	< 0.05	0.53	0.48	441	9.2	220	< 4.0	0.34
SH-5333Z	6.48	0.03	0.073	0.048	21.49	20.0	8.0	< 5.0	26.0	< 0.05	< 0.10	< 0.05	73	< 1.0	30	5.0	0.46
SH-77	6.40	0.01	0.030	0.020	23.79	6.0	3.2	< 5.0	16.0	0.210	< 0.10	< 0.05	26	< 1.0	40	< 4.0	2.20
SJ-266	NO DATA					252.0	128.0	5.0	680.0	< 0.05	1.60	0.46	850	17.1	475	< 4.0	5.00
SJB-173	7.69	0.87	1.721	1.119	21.63	429.0	307.0	30.0	188.0	0.065	2.00	0.27	1,420	< 1.0	960	< 4.0	1.00
SJB-173	7.69	0.87	1.721	1.119	21.63	429.0	313.0	30.0	202.0	< 0.05	2.00	0.27	1,400	< 1.0	905	< 4.0	1.30
SL-679	7.78	0.17	0.363	0.236	25.68	272.0	3.6	< 5.0	< 5.0	0.210	0.66	0.36	319	11.1	165	6.0	0.28
ST-1135	7.22	0.25	0.526	0.342	37.25	262.0	11.2	15.0	8.0	< 0.05	1.20	0.28	431	11.7	280	< 4.0	0.44
ST-11516Z	8.67	0.14	0.304	0.197	20.49	146.0	8.8	10.0	40.0	0.084	< 0.10	0.33	267	1.9	155	< 4.0	1.10
ST-5245Z	5.27	0.02	0.039	0.025	21.03	4.0	4.4	< 5.0	28.0	0.520	0.15	< 0.05	31	< 1.0	25	< 4.0	0.59
ST-532	8.94	0.16	0.341	0.222	23.02	152.0	3.1	< 5.0	< 5.0	0.240	0.51	0.36	323	12.1	245	< 4.0	0.30
ST-6711Z	7.73	0.33	0.673	0.438	20.90	338.0	16.6	40.0	< 5.0	< 0.05	1.50	0.42	502	2.6	425	< 4.0	0.15
ST-820	8.85	0.38	0.766	0.498	17.15	355.0	73.9	< 5.0	< 5.0	0.280	0.87	0.32	723	14.6	440	< 4.0	1.50
ST-995	8.36	0.09	0.199	0.129	25.58	98.1	3.2	5.0	12.0	< 0.05	0.56	0.59	169	8.6	145	< 4.0	0.37
ST-FOLSOM	8.80	0.13	0.272	0.177	29.40	172.0	3.4	5.0	8.0	< 0.05	0.70	0.21	217	9.4	135	4.0	0.37
ST-FOLSOM	8.80	0.13	0.272	0.177	29.40	133.0	3.3	10.0	8.0	< 0.05	0.81	0.22	224	9.4	145	< 4.0	0.55
TA-10046Z	7.97	0.04	0.094	0.061	21.27	31.6	3.9	5.0	18.0	0.050	1.00	0.08	65	1.8	100	< 4.0	0.16
TA-284	8.26	0.13	0.281	0.183	23.13	124.0	3.0	< 5.0	6.0	< 0.05	0.21	0.26	283	8.8	240	< 4.0	0.49
TA-284	8.26	0.13	0.281	0.183	23.13	126.0	2.9	< 5.0	< 5.0	< 0.05	0.11	0.26	286	8.7	225	< 4.0	0.30
TA-286	5.95	0.03	0.059	0.038	20.30	16.0	2.5	< 5.0	30.0	< 0.05	< 0.10	< 0.05	54	2.9	60	6.0	0.27
TA-520	5.55	0.02	0.052	0.034	22.05	6.0	5.2	< 5.0	42.0	1.90	< 0.10	< 0.05	50	< 1.0	20	< 4.0	1.60
TA-560	8.79	0.11	0.228	0.148	29.11	107.0	3.2	5.0	< 5.0	< 0.05	0.54	0.64	194	8.2	155	< 4.0	0.41
TA-7627Z	6.36	0.02	0.038	0.025	20.71	6.3	3.9	5.0	8.0	0.053	1.60	< 0.05	24	< 1.0	30	< 4.0	0.17
TA-826	9.08	0.16	0.339	0.221	30.28	142.0	3.0	10.0	12.0	< 0.05	0.67	0.29	295	10.5	190	< 4.0	0.46

Table 4.1.6
Field measurements and conventional laboratory analytical results for parameters sampled.

DNR Well Number	pH SU	Sal. ppt	Sp. Cond. mmhos per cm	TDS g/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. µmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
Laboratory Detection Limits (MDL) →						**2**	**10/1**	**5**	**5**	**0.05**	**0.1**	**0.05**	**1**	**1**	**10**	**4.0**	**0.1**
Drinking Water Limit/Type‡	**≥6.5, ≤8.5**	**N/A**	**N/A**	**0.5**	**N/A**	**N/A**	**250 (S)**	**15 (S)**	**N/A**	**10 (P)**	**N/A**	**N/A**	**N/A**	**250 (S)**	**500 (S)**	**N/A**	**TT**
	Field Parameters					**Conventional Laboratory Parameters**											
WA-241	5.42	0.04	0.090	0.059	19.62	20.9	3.3	< 5.0	20.0	< 0.05	0.13	0.06	84	9.8	45	< 4.0	6.00
WA-241	5.42	0.04	0.090	0.059	19.62	23.0	3.4	< 5.0	20.0	< 0.05	0.32	0.06	83	9.6	25	< 4.0	2.90
WA-248	8.58	0.18	0.376	0.245	26.46	185.0	10.9	30.0	10.0	0.086	0.84	0.57	336	8.2	230	< 4.0	0.63
WA-5210Z	7.88	0.07	0.160	0.104	21.46	62.0	3.2	< 5.0	48.0	< 0.05	0.29	0.23	158	8.7	165	< 4.0	0.23
WA-5295Z	5.50	0.01	0.035	0.023	21.77	6.0	2.1	< 5.0	28.0	< 0.05	0.21	< 0.05	27	< 1.0	35	< 4.0	0.29
WA-5311Z	4.13	0.01	0.032	0.021	20.93	2.0	3.2	< 5.0	16.0	0.700	< 0.10	< 0.05	28	< 1.0	< 10.0	< 4.0	0.99
WBR-181	9.14	0.14	0.300	0.195	23.73	376.0	2.9	< 5.0	< 5.0	0.210	0.46	0.31	257	9.0	160	< 4.0	0.32
WF-264	8.10	0.14	0.289	0.188	24.48	185.0	2.4	< 5.0	22.0	< 0.05	0.62	0.16	302	9.1	155	< 4.0	0.63
WF-264	8.10	0.14	0.289	0.188	24.48	185.0	3.3	5.0	22.0	< 0.05	0.53	0.12	304	9.2	165	< 4.0	0.37
WF-DELEE	5.78	0.04	0.088	0.057	19.53	19.0	9.5	5.0	16.0	0.950	1.10	0.07	86	< 1.0	120	< 4.0	0.21

‡ P – Primary, S – Secondary, AL – Action Level, TT – Treatment
* Denotes Duplicate Sample; Exceeds USEPA Secondary Standards

Table 4.1.7

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

DNR Well Number	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1**	**1**	**1**	**1/0.5**	**1**	**1**	**3**	**50**	**1**	**0.2**	**1**	**1**	**0.5**	**0.5**	**5**
Drinking Water Limit and Type‡	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
AN-266	< 1.0	< 1.0	112.0	< 1.0	< 1.0	1.1	< 3.0	132.0	< 1.0	< 0.20	1.0	1.9	0.85	0.88	12.0
AN-316	< 1.0	< 1.0	348.0	< 1.0	< 1.0	< 1.0	< 3.0	168.0	< 1.0	< 0.20	< 1.0	2.8	< 0.50	< 0.50	< 5.0
AN-321	< 1.0	< 1.0	243.0	< 1.0	< 1.0	< 1.0	< 3.0	154.0	< 1.0	< 0.20	< 1.0	3.5	< 0.50	< 0.50	6.3
AN-337	< 1.0	< 1.0	331.0	< 1.0	< 1.0	< 1.0	< 3.0	235.0	< 1.0	< 0.20	< 1.0	2.9	< 0.50	< 0.50	139.0
AN-500	< 1.0	< 1.0	105.0	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	75.8
AN-6297Z	< 1.0	< 1.0	502.0	< 1.0	< 1.0	< 1.0	< 3.0	139.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
AN-9183Z	< 1.0	< 1.0	33.4	< 1.0	< 1.0	1.1	3.3	< 50.0	< 1.0	< 0.20	< 1.0	1.4	< 0.50	< 0.50	7.6
AN-9183Z	< 1.0	< 1.0	35.6	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	5.8
AV-680	< 1.0	< 1.0	76.8	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	44.2
AV-680	< 1.0	< 1.0	80.0	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
EB-1003	< 1.0	< 1.0	16.2	< 0.50	< 1.0	< 1.0	6.9	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
EB-1231	< 1.0	< 1.0	135.0	< 1.0	< 1.0	< 1.0	< 3.0	54.2	< 1.0	< 0.20	< 1.0	2.8	< 0.50	< 0.50	8.3
EB-34	< 1.0	1.5	185.0	< 1.0	< 1.0	< 1.0	4.5	8,680.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	8.9
EB-630	< 1.0	< 1.0	76.2	< 0.50	< 1.0	< 1.0	14.6	182.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
EB-854	< 1.0	< 1.0	5.4	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
EB-8599Z	< 1.0	< 1.0	206.0	< 1.0	< 1.0	< 1.0	< 3.0	348.0	< 1.0	< 0.20	< 1.0	1.7	< 0.50	< 0.50	< 5.0
EB-8599Z	< 1.0	< 1.0	204.0	< 1.0	< 1.0	< 1.0	< 3.0	338.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
EB-991B	< 1.0	< 1.0	25.8	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	6.0
EF-272	< 1.0	< 1.0	7.1	< 0.50	< 1.0	< 1.0	8.1	< 50.0	1.3	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	9.3
EF-5329Z	< 1.0	< 1.0	22.4	< 1.0	< 1.0	< 1.0	12.6	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	25.8
EF-MILEY	< 1.0	< 1.0	79.0	< 1.0	< 1.0	< 1.0	108.0	< 50.0	3.1	< 0.20	1.1	< 1.0	< 0.50	< 0.50	51.2
JF-224	< 1.0	< 1.0	130.0	< 1.0	< 1.0	< 1.0	< 3.0	349.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
JF-224	< 1.0	< 1.0	125.0	< 1.0	< 1.0	1.2	12.3	330.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	7.2
LI-185	< 1.0	< 1.0	17.3	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	1.4	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
LI-229	< 1.0	< 1.0	10.1	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
LI-257	< 1.0	< 1.0	6.7	< 0.50	< 1.0	< 1.0	< 3.0	56.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0

Table 4.1.7

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

DNR Well Number	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1**	**1**	**1**	**1/0.5**	**1**	**1**	**3**	**50**	**1**	**0.2**	**1**	**1**	**0.5**	**0.5**	**5**
Drinking Water Limit and Type‡	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
LI-299	< 1.0	< 1.0	5.0	< 0.50	< 1.0	< 1.0	16.3	59.5	2.4	< 0.20	1.3	< 1.0	< 0.50	< 0.50	35.6
LI-5477Z	< 1.0	< 1.0	91.9	< 1.0	< 1.0	< 1.0	< 3.0	69.2	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	5.4
LI-7945Z	< 1.0	< 1.0	45.5	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
LI-7945Z	< 1.0	< 1.0	49.3	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
PC-275	< 1.0	< 1.0	9.0	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
PC-325	< 1.0	< 1.0	6.5	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
SC-179	< 1.0	< 1.0	99.0	< 1.0	< 1.0	< 1.0	< 3.0	265.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
SH-104	< 1.0	< 1.0	3.0	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
SH-5333Z	< 1.0	< 1.0	69.9	< 1.0	< 1.0	< 1.0	44.7	< 50.0	3.4	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	6.5
SH-77	< 1.0	< 1.0	10.0	< 1.0	< 1.0	< 1.0	18.4	116.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	137.0
SJ-226	< 1.0	10.4	354.0	< 1.0	< 1.0	< 1.0	< 3.0	1,540.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
SJB-173	< 1.0	< 1.0	408.0	< 0.50	< 1.0	< 1.0	< 3.0	547.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	7.3
SJB-173	< 1.0	< 1.0	406.0	< 0.50	< 1.0	< 1.0	< 3.0	536.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	12.5
SL-679	< 1.0	< 1.0	15.3	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-1135	< 1.0	< 1.0	14.2	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-11516Z	< 1.0	< 1.0	59.0	< 1.0	< 1.0	< 1.0	< 3.0	334.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-5245Z	< 1.0	< 1.0	38.8	< 1.0	< 1.0	< 1.0	20.3	96.9	2.4	< 0.20	1.1	< 1.0	< 0.50	< 0.50	18.0
ST-532	< 1.0	< 1.0	5.0	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-6711Z	< 1.0	< 1.0	10.7	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-820	< 1.0	< 1.0	14.8	< 1.0	< 1.0	< 1.0	20.2	125.0	8.4	< 0.20	3.0	< 1.0	< 0.50	< 0.50	500.0
ST-995	< 1.0	< 1.0	8.8	< 0.50	< 1.0	< 1.0	4.0	54.8	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-FOLSOM	< 1.0	< 1.0	2.3	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
ST-FOLSOM	< 1.0	< 1.0	2.5	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
TA-10046Z	< 1.0	< 1.0	68.9	< 0.50	< 1.0	1.1	3.2	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	50.9
TA-284	< 1.0	< 1.0	16.1	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
TA-284	< 1.0	< 1.0	16.2	< 1.0	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
TA-286	< 1.0	< 1.0	59.5	< 1.0	< 1.0	< 1.0	3.5	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	5.1

Table 4.1.7

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

DNR Well Number	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1**	**1**	**1**	**1/0.5**	**1**	**1**	**3**	**50**	**1**	**0.2**	**1**	**1**	**0.5**	**0.5**	**5**
Drinking Water Limit and Type‡	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
TA-520	< 1.0	< 1.0	53.6	< 1.0	< 1.0	< 1.0	631.0	104.0	3.4	< 0.20	7.8	< 1.0	< 0.50	< 0.50	376.0
TA-560	< 1.0	< 1.0	< 1.0	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
TA-7627Z	< 1.0	< 1.0	12.3	< 0.50	< 1.0	< 1.0	4.9	< 50.0	1.5	< 0.20	1.1	< 1.0	< 0.50	< 0.50	47.7
TA-826	< 1.0	< 1.0	22.1	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WA-241	< 1.0	< 1.0	81.8	< 1.0	< 1.0	< 1.0	21.8	1,710.0	3.4	< 0.20	9.8	< 1.0	< 0.50	< 0.50	72.3
WA-241	< 1.0	< 1.0	81.9	< 1.0	< 1.0	< 1.0	7.6	1,720.0	1.2	< 0.20	6.0	< 1.0	< 0.50	< 0.50	39.4
WA-248	< 1.0	< 1.0	5.4	< 0.50	< 1.0	< 1.0	< 3.0	456.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WA-5210Z	< 1.0	< 1.0	66.0	< 1.0	< 1.0	< 1.0	< 3.0	605.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WA-5295Z	< 1.0	< 1.0	63.7	< 1.0	< 1.0	1.2	6.2	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	14.2
WA-5311Z	< 1.0	< 1.0	13.4	< 1.0	< 1.0	2.0	3.0	< 50.0	1.1	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	6.9
WBR-181	< 1.0	< 1.0	1.9	< 0.50	< 1.0	< 1.0	11.9	53.8	1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WF-264	< 1.0	< 1.0	44.6	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WF-264	< 1.0	< 1.0	44.2	< 0.50	< 1.0	< 1.0	< 3.0	< 50.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	< 5.0
WF-DELEE	< 1.0	< 1.0	39.2	< 0.50	< 1.0	< 1.0	< 3.0	247.0	< 1.0	< 0.20	< 1.0	< 1.0	< 0.50	< 0.50	53.4

‡ P – Primary, S – Secondary, AL – Action Level
*Denotes Duplicate Sample. Exceeds EPA Primary Standards. Exceeds EPA Secondary Standards

Table 4.1.8

Field and conventional statistics for ASSET wells sampled in the Southern Hills Aquifer System.

	Parameter	Minimum	Maximum	Average
Field	Temperature (^{O}C)	17.15	37.25	23.78
	pH (SU)	4.13	9.14	7.66
	Specific Conductance (mmhos/cm)	0.03	2.40	0.46
	Salinity (ppt)	0.01	0.96	0.21
	TDS (g/L)	0.020	1.540	0.296
Conventional	Alkalinity (mg/L)	2	585	165
	Chloride (mg/L)	2.1	629.1	50.1
	Color (PCU)	<5	100.0	9.6
	Specific Conductance (umhos/cm)	9	2,380	426
	Sulfate (mg/L)	<1.0	17.1	5.6
	TDS (mg/L)	<10	1,220	268
	TSS (mg/L)	<4	<4	12
	Turbidity (NTU)	0.14	37.70	1.31
	Hardness (mg/L)	<5	680	42
	Nitrite - Nitrate, as N (mg/L)	<0.05	1.90	0.11
	TKN (mg/L)	<0.10	2.70	0.63
	Total Phosphorus (mg/L)	<0.05	0.72	0.24

Table 4.1.9

Inorganic (Total Metals) statistics for ASSET wells sampled in the Southern Hills Aquifer System.

Parameter	Minimum	Maximum	Average
Antimony (µg/L)	<1	<1	<1
Arsenic (µg/L)	<1	10.4	<1
Barium (µg/L)	<1	502.0	82.7
Beryllium (µg/L)	<1	<1	<1
Cadmium (µg/L)	<1	<1	<1
Chromium (µg/L)	<1	2.0	<1
Copper (µg/L)	<3	631.0	15.7
Iron (µg/L)	<50	8,680	309
Lead (µg/L)	<1	8.4	<1
Mercury (µg/L)	<0.2	<0.2	<0.2
Nickel (µg/L)	<1	9.8	<1
Selenium (µg/L)	<1	3.5	<1
Silver (µg/L)	<0.5	0.85	<0.5
Thallium (µg/L)	<0.5	0.88	<0.5

Table 4.1.9

Inorganic (Total Metals) statistics for ASSET wells sampled in the Southern Hills Aquifer System.

Parameter	Minimum	Maximum	Average
Zinc (µg/L)	<5	500.0	28.1

Table 4.1.10

LDEQ ASSET Program field parameters, conventional, and inorganic analytes with applicable USEPA National Primary (MCL) and Secondary (SMCL) Drinking Water Standards and Action Levels (AL).

Parameter/Analyte		MCL Type / Limit	Unit
FIELD	Temperature (Temp)	-	Degrees C.
	pH	SMCL / ≥ 6.5, ≤ 8.5	SU
	Specific Conductance (Sp. Cond.)	-	mmhos/cm
	Salinity (Sal.)	-	ppt
	Total Dissolved Solids (TDS)	SMCL / 0.5	g/L
CONVENTIONALS	Alkalinity (Alk)	-	mg/L
	Chloride (Cl)	SMCL / 250	mg/L
	Color	SMCL / 15	PCU
	Specific Conductance (Sp. Cond.)	-	umhos/cm
	Sulfate (SO4)	SMCL / 250	mg/L
	Total Dissolved Solids (TDS)	SMCL / 500	mg/L
	Total Suspended Solids (TSS)	-	mg/L
	Turbidity (Turb)	*MCL / 1	NTU
	Ammonia (NH3)	-	mg/L
	Hardness (Hard)	-	mg/L
	Nitrite-Nitrate (NO2NO3)	MCL / 10	mg/L
	Total Kjeldahl Nitrogen (TKN)	-	mg/L
	Total Phosphorus (Tot. P)	-	mg/L

Table 4.1.10

LDEQ ASSET Program field parameters, conventional, and inorganic analytes with applicable USEPA National Primary (MCL) and Secondary (SMCL) Drinking Water Standards and Action Levels (AL).

Parameter/Analyte		MCL Type / Limit	Unit
INORGANICS (TOTAL METALS)	Antimony	MCL / 6	µg/L
	Arsenic	MCL / 10	µg/L
	Barium	MCL / 2,000	µg/L
	Beryllium	MCL / 4	µg/L
	Cadmium	MCL / 5	µg/L
	Chromium	MCL / 100	µg/L
	Copper	AL / 1,300	µg/L
	Iron	SMCL / 300	µg/L
	Lead	AL / 15	µg/L
	Mercury	MCL / 2	µg/L
	Nickel	-	µg/L
	Selenium	MCL / 50	µg/L
	Silver	SMCL / 100	µg/L
	Thallium	MCL / 2	µg/L
	Zinc	SMCL / 5,000	µg/L

MCL = Primary Maximum Contaminant Level; SMCL = Secondary Maximum Contaminant Level; AL = Action Level

* Only applies to public water supply (PWS) systems with surface water source, or groundwater source under the direct influence of surface water. Louisiana Department of Health and Hospitals has determined that no PWS well falls in this category.

Table 4.1.11

ASSET Program Volatile Organic Compounds analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
1,1-Dichloroethane	624	0.5
1,1- Dichloroethene	624	0.5
1,1,1-Trichloroethane	624	0.5
1,1,2- Trichloroethane	624	0.5
1,1,2,2-Tetrachloroethane	624	0.5
1,2-Dichlorobenzene	624	0.5
1,2-Dichloroethane	624	0.5
1,2-Dichloropropane	624	0.5
1,3- Dichlorobenzene	624	0.5
1,2,3-Trichlorobenzene	624	1.0
1,4-Dichlorobenzene	624	0.5
Benzene	624	0.5
Bromoform	624	0.5
Carbon Tetrachloride	624	0.5
Chlorobenzene	624	0.5
Dibromochloromethane	624	0.5
Chloroethane	624	0.5
trans-1,2-Dichloroethene	624	0.5
cis-1,3-Dichloropropene	624	0.5
Bromodichloromethane	624	0.5
Methylene Chloride	624	0.5
Ethyl Benzene	624	0.5
Bromomethane	624	0.5
Chloromethane	624	0.5
o-Xylene	624	1.0
Styrene	624	1.0
Methyl-t-Butyl Ether	624	0.5
Tetrachloroethene	624	0.5
Toluene	624	0.5
trans-1,3-Dichloropropene	624	0.5
Trichloroethene	624	0.5
Trichlorofluoromethane	624	0.5
Chloroform	624	0.5
Vinyl Chloride	624	0.5
m & p-Xylenes	624	2.0

Table 4.1.12

ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
1,2,4-TRICHLOROBENZENE	625	10
2,4,6-TRICHLOROPHENOL	625	10
2,4-DICHLOROPHENOL	625	10
2,4-DIMETHYLPHENOL	625	10
2,4-DINITROPHENOL	625	10
2,4-DINITROTOLUENE	625	10
2,6-DINITROTOLUENE	625	10
2-CHLORONAPHTHALENE	625	10
2-CHLOROPHENOL	625	10
2-NITROPHENOL	625	10
3,3'-DICHLOROBENZIDINE	625	5
4,6-DINITRO-2-METHYLPHENOL	625	10
4-BROMOPHENYL PHENYL ETHER	625	10
4-CHLORO-3-METHYLPHENOL	625	10
4-CHLOROPHENYL PHENYL ETHER	625	10
4-NITROPHENOL	625	10
ACENAPHTHENE	625	10
ACENAPHTHYLENE	625	10
ANTHRACENE	625	10
BENZIDINE	625	30
BENZO(A)ANTHRACENE	625	5
BENZO(A)PYRENE	625	5
BENZO(B)FLUORANTHENE	625	10
BENZO(G,H,I)PERYLENE	625	10
BENZO(K)FLUORANTHENE	625	5
BENZYL BUTYL PHTHALATE	625	10
BIS(2-CHLOROETHOXY) METHANE	625	10
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	625	10
BIS(2-CHLOROISOPROPYL) ETHER	625	10
BIS(2-ETHYLHEXYL) PHTHALATE	625	10
CHRYSENE	625	5
DIBENZ(A,H)ANTHRACENE	625	5
DIETHYL PHTHALATE	625	10
DIMETHYL PHTHALATE	625	10
DI-N-BUTYL PHTHALATE	625	10
DI-N-OCTYLPHTHALATE	625	10
FLUORANTHENE	625	10
FLUORENE	625	10
HEXACHLOROBENZENE	625	5
HEXACHLOROBUTADIENE	625	10

Table 4.1.12

ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.

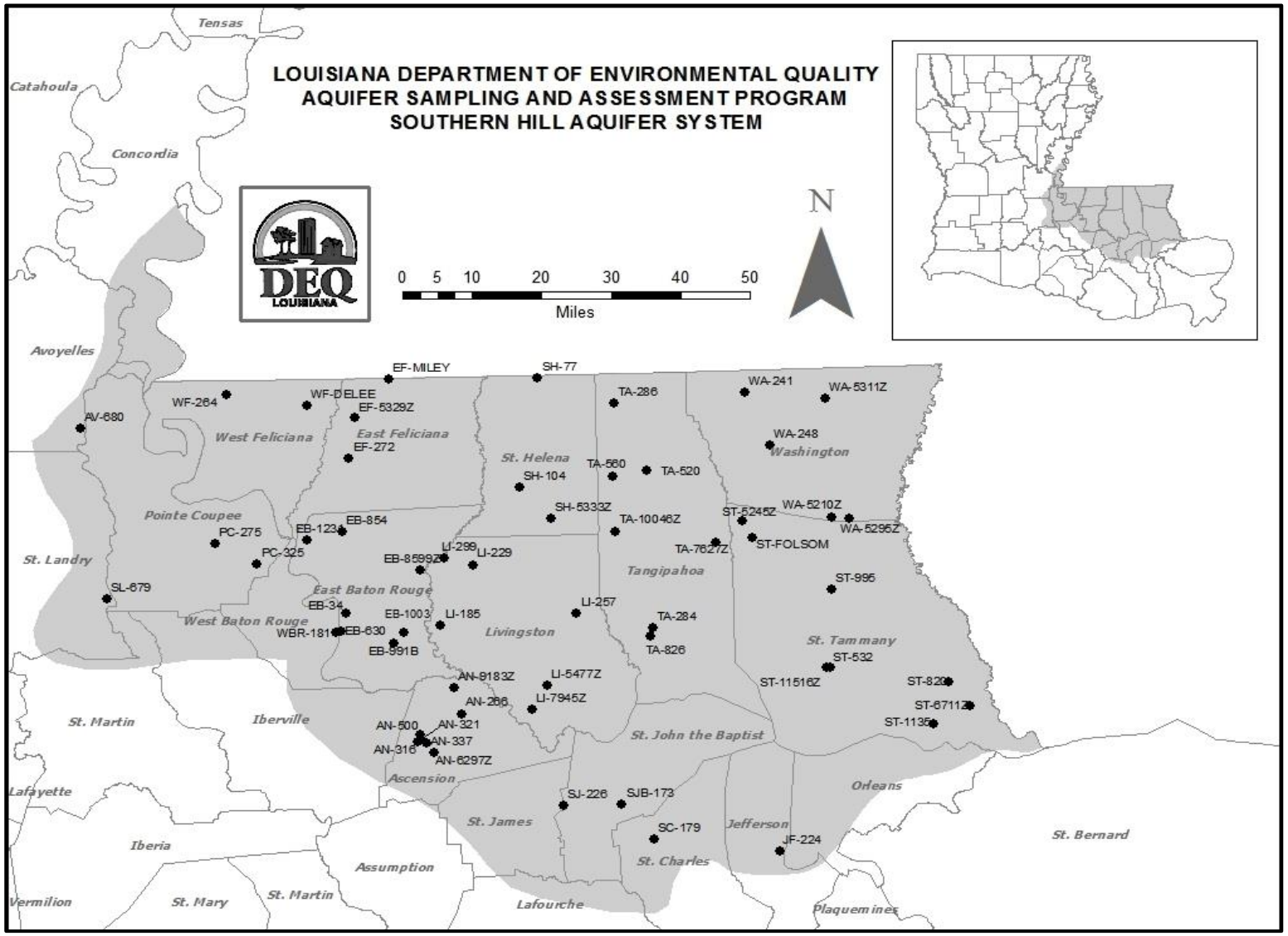
Compound	Method	Detection Limits (µg/L)
HEXACHLOROCYCLOPENTADIENE	625	10
HEXACHLOROETHANE	625	10
INDENO(1,2,3-C,D)PYRENE	625	5
ISOPHORONE	625	10
NAPHTHALENE	625	10
NITROBENZENE	625	10
N-NITROSODIMETHYLAMINE	625	10
N-NITROSODI-N-PROPYLAMINE	625	10
N-NITROSODIPHENYLAMINE	625	10
PENTACHLOROPHENOL	625	5
PHENANTHRENE	625	10
PHENOL	625	10
PYRENE	625	10

Table 4.1.13

ASSET Program Pesticide and PCB analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
ALDRIN	608	0.01
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	608	0.05
ALPHA ENDOSULFAN	608	0.01
ALPHA-CHLORDANE	608	0.05
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	608	0.05
BETA ENDOSULFAN	608	0.02
CHLORDANE	608	0.20
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	608	0.05
DIELDRIN	608	0.02
ENDOSULFAN SULFATE	608	0.10
ENDRIN	608	0.02
ENDRIN ALDEHYDE	608	0.10
ENDRIN KETONE	608	0.10
GAMMA BHC (LINDANE)	608	0.05
GAMMA-CHLORDANE	608	0.05
HEPTACHLOR	608	0.01
HEPTACHLOR EPOXIDE	608	0.01
METHOXYCHLOR	608	0.50
P,P'-DDD	608	0.10
P,P'-DDE	608	0.10
P,P'-DDT	608	0.02
PCB-1016 (AROCHLOR 1016)	608	0.20
PCB-1221 (AROCHLOR 1221)	608	0.20
PCB-1232 (AROCHLOR 1232)	608	0.20
PCB-1242 (AROCHLOR 1242)	608	0.20
PCB-1248 (AROCHLOR 1248)	608	0.20
PCB-1254 (AROCHLOR 1254)	608	0.20
PCB-1260 (AROCHLOR 1260)	608	0.20
TOXAPHENE	608	0.30

Figure 4.1.1 - Location Plat of the Southern Hills Aquifer System and Associated Water Wells.



GLOSSARY

Agriculture – Agriculture involves the use of water for crop spraying, irrigation, livestock watering, poultry operations and other farm purposes not related to human consumption.

Clean technique metals analysis – an integrated system of sample collection and laboratory analytical procedures designed to detect concentrations of trace metals below criteria levels and eliminate or minimize inadvertent sample contamination that can occur during traditional sampling practices.

Degree of support – The level at which water quality supports the designated uses of a water body specified in the Louisiana Water Quality Standards. The degree of support is divided into two levels: fully supporting uses and not supporting uses.

Designated water use – A use of the waters of the state as established by the Louisiana Water Quality Standards. These uses include primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), drinking water supply (DWS), outstanding natural resource waters (ONR), oyster propagation (OYS), agricultural activities (AGR), and limited aquatic life and wildlife (LAL). (See also Use Support.)

Dissolved oxygen – The amount of oxygen dissolved in water, commonly expressed as a concentration in terms of milligrams per liter, mg/L.

Drinking water supply – A surface or underground raw water source which, after conventional treatment, will provide safe, clear, potable, and aesthetically pleasing water for uses which include but are not limited to, human consumption, food processing and cooking, and as a liquid ingredient in foods and beverages.

Effluent – Wastewater discharged to waters of the state.

Effluent limitation – Any applicable state or federal quality or quantity limitation which imposes any restriction or prohibition on quantities, discharge rates, and concentrations of pollutants which are discharged into waters of the state.

Effluent-limited segment – Any stream segment where water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable standards after the application of effluent limitations required by the Clean Water Act, as amended.

Evaluated waters – Water bodies for which assessment is based on information other than current site-specific ambient data, such as data on land use, location of pollutant sources, fisheries surveys, fish kill investigations, spill investigations, and citizen complaints.

Existing use – Those uses actually attained in the water body on or after November 28, 1975. They may or may not be designated uses.

Fecal coliform – Gram negative, non-spore forming, rod-shaped bacteria found in the intestinal tracts of warm-blooded animals.

Fish and wildlife propagation – Fish and wildlife propagation includes the use of water for preservation and reproduction of aquatic biota such as indigenous species of fish and invertebrates, as well as reptiles, amphibians, and other wildlife associated with the aquatic environment. This use also includes the maintenance of water quality at a level that prevents contamination of aquatic biota consumed by humans.

Limited Aquatic Life and Wildlife – A subcategory of fish and wildlife propagation that recognizes not all water bodies are capable of supporting the same level of species diversity and richness. Examples of water bodies to which this may be applied include intermittent streams and manmade water bodies that lack suitable riparian structure and habitat.

Monitored waters – Water bodies for which assessment is based on current site-specific ambient data.

Naturally dystrophic waters – Waters which are stained with organic material and which are low in dissolved oxygen due to natural conditions.

Nonpoint source – A diffuse source of water pollution that does not discharge through a point source or pipe, but instead flows freely across exposed natural or manmade surfaces, such as plowed fields, pasture land, construction sites, and parking lots.

Outstanding natural resource waters – Outstanding and natural resource waters include water bodies designated for preservation, protection, reclamation, or enhancement of wilderness and aesthetic qualities and ecological regimes, such as those designated under the Louisiana Natural and Scenic Rivers System or those designated by the Office of Environmental Compliance as waters of ecological significance. This use designation applies only to the water bodies specifically identified in Louisiana's numerical criteria, LAC 33:IX.1123, Table 3, and not to their tributaries or distributaries, unless so specified.

Oxygen-demanding substances – Organic matter or materials in water or wastewater which utilize oxygen during the decomposition process, and inorganic material, such as sulfides, which utilize oxygen during the oxidation process.

Oyster propagation – The use of water to maintain biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected. This use shall apply only to those water bodies named in the numerical criteria tables and not to their tributaries or distributaries unless so specified.

Point source – A discernible, confined and discrete conveyance including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Potentiometric surface – An imaginary surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well.

Primary contact recreation – Any recreational activity which involves or requires prolonged body contact with the water, such as swimming, water skiing, tubing, snorkeling, and skin-diving.

Riparian – Area of land along the banks of a stream which often exhibits slightly different vegetation and habitats than the surrounding landscape. Because of this variation, riparian areas are considered valuable wildlife habitat and important for the protection of water quality.

Subsegment – A named regulatory water body as defined by LAC 33:IX.1123. They are considered representative of the watershed through which they flow and, therefore, have numerical criteria assigned to them. This is the level of watersheds at which §305(b) assessments are applied. Each subsegment has a six digit number assigned in the following manner, 03=basin, 01=segment, 01=subsegment. This would be read as 030101, which represents Calcasieu River-headwaters to Highway 8. For mapping purposes, the subsegment is defined as a polygonal geographical area using GIS (Geographic Information System).

Secondary contact recreation – Any recreational activity which may involve incidental or accidental body contact with the water and during which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, and recreational boating.

Toxic substances – Any element, compound or mixture which at sufficient exposure levels induces deleterious acute or chronic physiological effects on an organism.

Wastewater – Liquid waste resulting from commercial, municipal, private, or industrial processes. This includes but is not limited to, cooling and condensing waters, sanitary sewage, industrial waste, and contaminated rainwater runoff.

Water body – Any contiguous body of water identified by the state. A water body can be a stream, a river, a segment of a stream or river, a lake, a bay, a series of bays, or a watershed.

Water quality-limited segment – Any stream segment where the stream does not meet applicable water quality standards or will not meet applicable water quality standards even after application of the effluent limitations required by the Clean Water Act, as amended.

Use support – A determination made by LDEQ as part of the Integrated Report process of whether or not a designated water use is being supported or met based on an analysis of water quality data or other information. Support statements include “Fully Supported,” “Not Supported,” and “Not Assessed” (See also Designated Water Use).

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LDWF. See Louisiana Department of Wildlife and Fisheries.

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LOSP. See Louisiana Office of State Parks.

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APPENDIX A: 2016 Integrated Report of Water Quality in Louisiana

Appendix A is taken from Louisiana's 2016 Assessment Database (ADB), which contains all water quality assessments for the state. All suspected causes of impairment and suspected sources of impairment are linked in a one to one fashion, meaning, a reported suspected cause of impairment is believed to be affected by the suspected source of impairment provided on the same line of the table. However, as a result of this linking, some suspected causes and/or sources may be listed more than once for a given water body subsegment. This results in cases where a suspected cause of impairment has two or more suspected sources of impairment. Likewise, if a suspected source of impairment affects two or more suspected causes of impairment, the suspected source will be listed more than once. This is important to note in order to prevent double counting when attempting to develop subtotals for the size or number of water bodies affected by a given suspected cause or suspected source of impairment.

The full text of Appendix A, including subsegment assessment maps for each basin can be found at: 16_IR1-Appendix A Text and Maps.

The full water quality assessment table is contained in Appendix A at: 16_IR1-FINAL-Appendix A-All Assessments.

APPENDIX B: 2016 Integrated Report of Water Quality in Louisiana – Category 1 Addendum

Appendix C, the 2016 Integrated Report, Category 1 Addendum, contains those water body impairment combinations (WICs) that were removed from LDEQ's 2014 Integrated Report during development of the 2014 Integrated Report. The WICs were removed because the suspected cause is no longer considered to be impairing water quality of the water body subsegment. Removal may be based on more recent water quality data collected after development of the 2016 Integrated Report, or due to advances in water quality assessment that permit more accurate determinations of water quality. This information does not constitute a formal §303(d) or §305(b) submittal, nor is this Category 1 listing a requirement of the Clean Water Act.

The full Category 1 table is contained in Appendix B at: 16 IR1-FINAL-Appendix B-Category 1.

APPENDIX C: Complete list of suspected causes of impairment and cause descriptions used in USEPA's Assessment Database

The full list of suspected causes of impairment is contained in Appendix C at: 16 IR1-FINAL-Appendix C-Causes.

APPENDIX D: Complete list of suspected sources and source descriptions used in USEPA's Assessment Database

The full list of suspected sources of impairment table is contained in Appendix D at: 16 IR1-FINAL-Appendix D-Sources.

APPENDIX E: Complete Listing of Louisiana's Ambient Surface Water Quality Network Sites

The full list of ambient surface water quality network sites is contained in Appendix E at: 16 IR1-FINAL-Appendix E-Monitoring Sites. Not all sites contained in this list are currently sampled as part of LDEQ's rotating monitoring sites program.

APPENDIX F: Public Comments on the 2016 Integrated Report and LDEQ's Response to Comments

Appendix F is a compilation of all comments received regarding the 2016 Integrated Report, along with LDEQ's response to those comments. Any changes made to the 2014 Integrated Report based on public comments are noted in the column titled, "Summary of LDEQ Responses." Also included in this response are changes made to the 2016 Integrated Report during the review period following public notice.

The full summary of public comments and LDEQ's responses is contained in Appendix F at:
16 IR1-FINAL-Appendix F-Response to Comments.

APPENDIX G: Louisiana's 2016 Section 303(d) List

Appendix G represents a subset of Louisiana's 2016 Integrated Report (IR) and includes only those water body impairment combinations (WICs) reported as Categories 5 or 5RC. As has been noted in the body of the IR text, WICs in Categories 5 and 5RC of the IR assessments are the only WICs on Louisiana's 2016 §303(d) List. This table was developed only as an aid to the public and does not constitute Louisiana's "official" §303(d) List. Every effort was made to maintain consistency between Appendix A Categories 5 and 5RC WICs and Appendix H. ***However, in order to ensure the accuracy of the overall Integrated Report, only those WICs in Appendix A, Categories 5 and 5RC, constitute the "official" §303(d) List.***

The full table of §303(d) Listed WICs, with the caveat noted above, is contained in Appendix G at: 16 IR1-FINAL-Appendix G-Cat 5 303d List.